APPENDIX K

QUALITY CONTROL PLAN
&
TECHNICAL REVIEW

SECTION 1. QUALITY CONTROL PLAN

Quality Control Plan
For
Planning and Design Analysis

Upper Mississippi River System--
Environmental Management Program (UMRS-EMP)

Schenimann Chute Side Channel Project

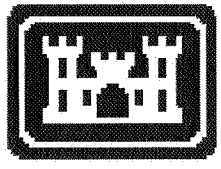
Technical Lead

Tamara Atchley
CEMVS-PM-N

Project Manager

Mike Thompson
CEMVS-PM-N

Revised: June 2003



U.S. Army Corps of Engineers
St. Louis District
1222 Spruce Street
St. Louis, Missouri 63103-2833

QUALITY CONTROL PLAN

PROJECT: Upper Mississippi River System--Environmental Management Program (UMRS-EMP), Schenimann Chute Side Channel Project

LOCATION: Schenimann Chute is located along the right descending bank of the Mississippi River, from approximately river mile 75.2 to river mile 62.3. It lies 5 miles north of Cape Girardeau, Missouri, in Cape Girardeau County.

PRODUCT: Planning and Design Analysis (PDA) Report

APPLICABILITY: A PDA is a type of Corps documentation for which a Quality Control Plan (QCP) is typically prepared.

PURPOSE: This Quality Control Plan (QCP) is being prepared to identify the management practices and business procedures that are to be followed to insure that a quality product is produced on schedule and within budget that meets the requirements of the client.

1. **Report Objective:** To prepare a PDA report in sponsorship with the Missouri Department of Conservation under the authority of Section 1103 of the Water Resources Development Act of 1986 (as amended) and in accordance with Corps guidelines. The report will (1) determine if the water resource problem(s) warrant Federal participation, (2) further define the Federal interest based on a preliminary appraisal consistent with Army policies, costs, benefits, and environmental impacts of identified potential project alternatives, (3) assess the level of interest and support from non-Federal entities in the identified potential solutions, (4) prepare planning documentation and Plans and Specifications, and (5) prepare a Memorandum of Agreement (MOA) accompanied by a Project Management Plan (PMP).

2. **Project Description:** There is approximately 273 acres of aquatic area within the chute. The chute is one of 23 side channels that remain along the 202 miles of open river between St. Louis, Missouri and Cairo, Illinois, at the mouth of the Ohio River. Schenimann Chute has been degraded by the accumulation of sediment and, without action, will become part of the adjacent land, thus eliminating an important habitat component of the open river ecosystem. The project includes notching of existing stone dikes, construction of stub dikes and/or hard points, placing of revetment and dredging sand at the lower end of the chute to improve connectivity with the river. Construction would occur in three phases: notching of dikes; placement of rock; and dredging of the lower end of the channel. The Missouri Department of Conservation (MDOC) provided a letter on 2 April 1999 expressing its sponsorship interest.

3. **Reference Documents:** References to be utilized during the preparation of the PDA include EC 1105-2-214, "Planning - Project Modifications for Improvement of the Environment and Aquatic Ecosystem Restoration", dated 30 November 1997; ER 1105-

2-100, "Guidance for Conducting Civil Works Planning Studies"; ER 1110-2-1150, "Engineering and Design for Civil Works Projects". To the extent possible, the Schenimann Chute Project has attempted to also comply with the District's new guidelines for the Product Delivery Team Business Process (PDTBP).

4. **Study Team:**

NAME	OFFICE SYMBOL	FUNCTION
Mike Thompson	CEMVS-PM-N	Project Management
Dave Kelly	CEMVS-PM-F	Economics
Eric Laux	CEMVS-PM-E	Environmental Compliance, Endangered Species, Habitat Quantification
Gary Lee	CEMVS-ED-DC	Engineering Coordinator
Dave Gordon	CEMVS-ED-HPR	River Engineering Unit
Leonard Hopkins	CEMVS-ED-HP	Potamology Section
Steele Beller	CEMVS-RE-A	Real Estate Acquisition Branch
Mike Ricketts	CEMVS-CO-F	Regulatory
Dan Erickson	CEMVS-CO-N	Riverlands Project
DaWayne Sanders	CEMVS-ED-C	Cost Estimates
Jim Lynch	CEMVS-CO-TO	Natural Resources Mgmt
Dave Gates	CEMVS-PM-F	Plan Formulation Advisor, Report Consolidation

4. **Reviews/Coordination:**

a. **Internal Product Review:** Technical elements are responsible for producing quality services and/or products. Technical adequacy and quality shall be obtained through periodic internal review and shall be documented through certification of study team checklists by the Branch/Division chiefs responsible for product preparation.

b. **Independent Technical Review (ITR):** An ITR shall be performed by the St. Louis District. The expertise and technical backgrounds of the ITR team members shall qualify them to provide a comprehensive technical review of the product. The review shall be ongoing through product development, rather than a cumulative review performed at the end of the investigation. All comments resulting from the ITR shall be recorded and resolved prior to forwarding the Planning and Design Analysis (PDA) to higher authority and local interests. The ITR documentation shall be submitted along with the completed PDA to the Mississippi Valley Division (CEMVD). Review Team members include:

NAME	OFFICE SYMBOL	FUNCTION
Tamara Atchley	CEMVS-PM-F	Project Management
Rayford Wilbanks	CEMVD	Economics
T. Miller	CEMVS-PM-EA	Environmental Compliance, Endangered Species, Habitat Quantification
Mike Rector	CEMVS-ED-DC	Engineering Coordinator
Robert Davinroy	CEMVS-ED-HPR	River Engineering, Potamology
Sharon Wolf	CEMVS-RE-A	Real Estate Acquisition Branch
Danny McClendon	CEMVS-CO-F	Regulatory
Stan Ebersohl	CEMVS-CO-N	Riverlands Project
	CEMVS-ED-C	Cost Estimates
Lynn Neher	CEMVS-CO-TO	Natural Resources Mgmt
Michelle Brown	CEMVS-PM-F	Planning & Project Development

c. **Quality Control/Policy Review:** CEMVD is responsible for overseeing the quality control process relating to the development of decision and implementation documents. In its quality assurance role, CEMVD assures that its subordinate districts have the mechanisms/procedures in place to produce quality products that comply with established criteria, methods, policies, laws and procedures; and apply competent technical resources in execution and review. CEMVD shall facilitate and/or assist in the resolution of policy and technical issues.

d. **Site Visits:** Study team members and reviewers shall conduct site visits as needed. Site visits shall be coordinated with the project manager and local entities.

e. **Communication:** Study team members and reviewers are responsible for reading all written documents relating to the project. Regularly scheduled meetings shall be held throughout the study to be used as a formum for discussing issues related to product quality. Team members, managers, and reviewers are responsible for communicating issues, concerns and problems as soon as they are recognized, so that appropriate solutions can be developed in a timely manner. Documentation of formal and informal meetings, CC:Mail, E-Mail, and in-progress technical and/or policy reviews shall be maintained and be available for reference.

5. **Schedule:** A determination of Federal interest was submitted to CEMVD in April 1999 via the District's submission of the PRP. The PRP was approved by CEMVD on 4 April 2003. The final PDA will be completed by November 03.

6. **Cost Estimate:**

WORK PHASE	COST
Preparation of PRP	$5,000 (Actual)
Preparation of PDA	$ 230,700 (Estimate)
Subtotal	$ 235,700
Project Implementation	$2,532,700 (Estimate)
Subtotal	$2,532,700
Total Project Cost	$2,768,400 (Estimate)

7. **Milestones and Review Schedule:** See attached tables for PDA and implementation phases.

TASK	COMPLETION DATE
PLANNING AND DESIGN ANALYSIS PHASE	
Study Initiation (PRP)	May 99
Study Initiation (PDA)	Sep 00
Plan Formulation/Functional Engineering Analysis	May 01 – Nov 02
Start of Design Work:	
90% In-Progress Review	Nov 03
VE Review	Dec 02
Pre-Draft PDA/EA Preparation	April 03
Pre-Draft PDA/EA ITR	Feb 03
Draft PDA/EA Preparation	August 03
Agencies/Public Review	July 03
Final PDA/EA Preparation	Sept 03
Final PDA/EA	Nov 03

PROJECT IMPLEMENTATION PHASE	COMPLETION DATE
To Specs	TBD
BCOE	TBD
Lessons Learned	June 05
Product and Process Evaluation	Aug 05
Design Documentation Completed	Dec 05

TBD = Specific dates will be identified in Detailed Scope of Work and reflected in the product schedule.

8. Plan Coordination:

Submitted by: _____
Mike Thompson
Project Team Leader
CEMVS-PM-N

Concurred by: _____
Tamara Atchley
Independent Technical Review Team Leader
CEMVS-PM-F

Concurred by: _____
Dave Busse
Acting Chief, Project Management
CEMVS-PM-N

SECTION 2. TECHNICAL REVIEW

TECHNICAL REVIEW

INTRODUCTION.

This section summarizes the results of the District's review of the Pre-draft PDA/EA document. This review was conducted in accordance with the QCP described in Section 1. This preliminary review was guided by and documented with a QCP checklist developed specifically for habitat restoration projects. The technical review included a verification of: (1) assumptions, (2) methods, procedures, & material used in analyses based on level, (3) alternatives evaluated are reasonable, (4) appropriateness of data used and level of data obtained, (5) reasonableness of results, and (6) that the products meet customer needs, and are consistent with law and existing policy.

PRE-DRAFT PDA/EA REVIEW RESULTS.

During the Pre-draft PDA/EA comments were minor in nature. The major comment focused on the selection of Alternative 7 versus Alternative 5. Alternative 5 was the most cost effective alternative.

Several tables are provided, Table 1 is a composite QCP checklist and review summary for the project, Table 2 provides an ITR Certification Checklist to be signed at the time of report finalization, and Table 3 concludes with the Deputy District Engineer's Certification of Independent Technical Review.

TABLE 1. QUALITY CONTROL PROCEDURE CHECKLIST FOR PDA/EA

ITEM					YES/NO	COMMENTS (COMPOSITE)
GENERAL	1.	Authority	a.	Does the study conform to the cited study authority?	YES	
	2.	Scope of Investigation	a.	Have all the problems been adequately addressed (including significant resources, foreseeable future needs, and implications outside the study area)?	YES	
	3.	Objective of Investigation	a.	Are planning objectives clearly stated?	YES	
	4.	Risk-Based Analysis				
	5.	Chart of Accounts				
	6.	Project Cost Sharing	a.	Is the apportionment of costs to local interests in conformance with present policy and evaluation procedure?	YES	
			b.	Has a project letter of intent been received?	YES	Draft Letter of Intent for Public Notice
	7.	Coordination	a.	Was there adequate coordination with State, local, and Federal agencies, and were their views considered?	YES	
			b.	Has coordination conformed with law, executive orders, and agreements between agencies; if not, has the departure been satisfactorily explained?	YES	

			c.	Have the proper preservation, conservation, historical, and scientific interests been consulted, and their views given adequate consideration?	YES	
	8.	Public Involvement	a.	Was adequate public involvement conducted during the planning process to fully inform interested parties and to ascertain their views?		Underway, public meeting in Cape Girardeau, MO, 1 July 03.
			b.	Has coordination conformed with law, executive orders, and agreements between agencies; if not, has the departure been satisfactorily explained?	YES	
			c.	Has the process been documented, and a discussion of the process prepared?	YES	
	9.	Policy Aspects	a.	Does the proposed project conform with applicable policies?	YES	
			b.	Has consideration been given to current Administration policies and decisions?	YES	
	10.	Legal/Institutional	a.	Does the draft PCA reflect the current Corps model?	NO	No PCA is required, 100% Federal Funding.
			b.	Has the sponsor or their counsel reviewed and agreed to the PCA?	N/A	
			c.	Has certification of legal review of the PCA been obtained?	N/A	
			d.	Has the sponsor demonstrated that it possesses (or submitted a plan to obtain) all authorities necessary to implement its responsibilities under the PCA?	N/A	
			e.	Has a certification of legal review of the	YES	Draft from OC at draft PDA

				report been obtained?		
PLAN FORMULATION	1.	Scoping	a.	Have reasonable alternatives been adequately addressed?	YES	
			b.	Has recent guidance been incorporated in the study?	YES	
	2.	Existing Conditions/Plan Development	a.	Have the assumptions and rationale for the without-project conditions been stated and are they reasonable?	YES	
	3.	Alternatives Screening	a.	Have the effects of the selected and alternative plans been evaluated?	YES	
			b.	Has acquisition of necessary land for the project elements been adequately considered?	N/A	
			c.	Has a reasonable justification been provided for eliminating alternatives?	YES	
	4.	Plan Selection	a.	Are the reasons for the selection of the major elements of the recommended plan sound and adequate?	YES	
			b.	Is the selected plan consistent with any applicable comprehensive plans for the area?	YES	
	5.	Report Review	a.	Does the report format follow the most recent guidance?	YES	
			b.	Have all major technical review issues and resolutions been documented?	YES	
			c.	Is the technical review certification signature page included?	NO	Will be completed following the Public Notice and Public Mtg.
ECONOMIC AND SOCIAL ANALYSIS	1.	General	a.	Are the assumptions regarding future alternative conditions clearly stated, justified, and reasonable?	YES	
			b.	Have methodologies (BCR for 14's and	N/A	

				205's, and ICA for 206's and 1135's) and assumptions been explained in sufficient detail?		
			c.	Is the without-project condition reasonable and does it actually reflect how non-Federal interests will act if the resource under study is not developed?	YES	
			d.	Have any departures from the NED or most cost-effective ICA plan been adequately discussed?	YES	The recommended alternative is the second most cost-effective plan.
	2.	Flood Control Studies (only)	a.	Has an inventory of structures within the flood zone been conducted and a database of those with potential for flood-damage been completed?	N/A	
			b.	Have depth-damage functions been established?	N/A	
			c.	Have equivalent annual damages been calculated?	N/A	
	3.	Financial Analysis	a.	Has the local sponsor provided a financing plan and has a Commander's Assessment been prepared?	N/A	
			b.	Does the report indicate the sponsor's ability to finance its share of the project cost and to carry out project implementation, operation, maintenance, and repair/rehabilitation responsibilities?	YES	
ENVIRONMENTAL ANALYSIS	1.	NEPA Document Compliance	a.	Have the necessary technical studies and coordination been conducted in accordance with National	YES	Coordination is continuing.

				Environmental Policy Act of 1969 (NEPA) and other applicable environmental laws?		
			b.	Have the environmental conditions (existing and future) been appropriately defined?	YES	
			c.	Have the project effects (including mitigation) been considered for each alternative?	YES	
			d.	Has the appropriate level of scoping/coordination both internal and external (agencies, public) to the Corps been conducted?	YES	
			e.	Have secondary project impacts been addressed?	YES	
			f.	Have the environmental impacts of all reasonable alternatives been properly evaluated and displayed?	YES	
			g.	Will the activity to be conducted by a project beneficiary necessitate certification, Corps Section 404 Permit, flood height alteration permits, etc.) and, if so, has the activity been discussed?	YES	
			h.	Have all appropriate supplemental environmental studies been performed (e.g. Endangered Species Biological Assessment, Section 404 Analysis, habitat analysis, FWCAR or planning letter)?	YES	
			i.	Have responses to public comments been prepared?	NO	Underway
	2.	HTRW	a.	Was there a Phase I assessment performed and sensitive sites	YES	

				avoided?		
	3.	Mitigation	a.	Has the need, extent, and costs for any mitigation requirement been determined?	NO	None required.
	4.	Cultural Resources	a.	Has a scientifically defensible cultural resources inventory been performed and coordinated with the Advisory Council, SHPO, and other applicable laws and regulations?	YES	
			b.	Have the necessary cultural resource surveys been conducted?	YES	
			c.	Has an appropriate mitigation strategy been developed and coordinated?	N/A	
			d.	Has mitigation taken place?	N/A	
	5.	Aesthetics	a.	Has consideration been given to appropriate visual resources?	YES	
ENGINEERING DIVISION			a.	Were sound investigations (surveys, H&H, geotech, design and costs) conducted of appropriate scope and detail?	YES	
			b.	Is the project constructable and operable?	YES	
			c.	Are the construction and OM&R costs reasonable (including contingencies and S&A)?	YES	
			d.	Has there been adequate coordination between Environmental, Engineering and Real Estate Divisions?	YES	
			a.	Have the Rights-of-Way (ROW) submitted by locals been verified?	N/A	
			b.	Have adequate field investigations been	YES	

				conducted? Has every attempt been made to stay within existing or apparent ROW?		
			c.	Have all land damages and acquisition costs been identified?	N/A	
			d.	Has a Compensable Report and/or Real Estate Supplemental been prepared?	N/A	

TABLE 2. CHECKLIST CERTIFICATION SHEET SCHENIMANN CHUTE HABITAT RESTORATION PROJECT

I certify that the Schenimann Chute PDA/EA documentation has been reviewed, and that sound technical practices and procedures have been followed. The document conforms to pertinent regulations, guidance, and sound professional practices.

REVIEWER'S NAME	FUNCTIONAL AREA		REVIEWER'S SIGNATURE
	EXPERTISE	OFFICE SYMBOL	
Tamara Atchley	Project Management (ITRL)	CEMVS-PM-F	
Rayford Wilbanks	Economics	CEMVD	
T. Miller	Environmental Compliance, Endangered Species, Habitat Quantification	CEMVS-PM-EA	
Mike Rector	Engineering Coordinator	CEMVS-ED-DC	
Robert Davinroy	River Engineering, Potamology	CEMVS-ED-HPR	
Sharon Wolf	Real Estate Acquisition Branch	CEMVS-RE-A	
Danny McClendon	Regulatory	CEMVS-CO-F	
Stan Ebersohl	Riverlands Project	CEMVS-CO-N	
	Cost Estimates	CEMVS-ED-C	
Lynn Neher	Natural Resources Mgmt	CEMVS-CO-TO	
Michelle Brown	Planning & Project Development	CEMVS-PM-F	

TABLE 3. CERTIFICATION OF INDEPENDENT TECHNICAL REVIEW FOR THE SCHENIMANN CHUTE HABITAT RESTORATION PROJECT

Significant concerns and an explanation of there resolution has been described. All concerns resulting from the independent technical review of the project have been considered. The report and all associated documents required by the National Environmental Policy Act have been fully reviewed.

_____ _____

Joseph P. Kellett
Deputy District Engineer
for Planning, Programs, and
Project Management

Date

APPENDIX L

LEGAL REVIEW

CERTIFICATION OF LEGAL REVIEW

The Final Schenimann Chute Side Channel Project Planning and Design Analysis (PDA) Report and Environmental Assessment, dated _____2002, and the Memorándum of Agreement (MOA) between The Department of the Army and the Missouri Department of Natural Resources for the restoration of the Schenimann Chute Side Channel Project has been fully reviewed and found to be legally acceptable by the Office of Counsel, USACE, St. Louis District.

_____

LeeAnn Summer
Assistant District Counsel

CEMVS-OC 27 July 2000

MEMORANDUM FOR Chief, Project Management Branch for Navigation and Environment, ATTN: CEMVS-PM-N (Jackie Taylor)

SUBJECT: Request for Legal Opinion – Issues regarding UMRS-EMP Projects

1. Your request raised three issues regarding the District's Upper Mississippi River System (UMRS) Environmental Management Program (EMP). The following opinion is provided in accordance with your request.

2. Necessity of Cost Share Sponsor - Paragraph 3c of the current Corps policy regarding Land Acquisition for UMRS EMP, dated 30 November 1994, provides that a habitat project that includes a land acquisition component must have a non-federal sponsor to acquire the land, fulfill the construction cost sharing requirements, and assume full responsibility for all project operation and maintenance activities for fish and wildlife on such land. Further, paragraph 3d, states that "a habitat project or any portion thereof for which lands are to be acquired must be cost shared 75 percent Federal/25 percent non-federal." Based on your characterization, the Schenimann Chute Project is being undertaken to improve the habitat for the pallid sturgeon, a federally listed endangered species. Under the authority of Section 906(e) of the Water Resources Development Act (WRDA) of 1986 and ER 1105-2-100, paragraph 4-37 the cost of such projects are 100% federal, without the need for cost sharing with a non-federal sponsor. Thus, the plain reading of the policy appears to conflict with the provisions of the WRDA and the ER.

Upon closer examination, however, no conflict exists. The apparent intent of the policy relates to the approval authority of the North Central Division Commander for certain habitat projects with estimated construction cost of $2 million or less, that have a land acquisition component to them. Previous Corps policy did not grant the North Central Division Commander authority to approve fish and wildlife resources activities projects with land acquisition components. After the passage of the 1986 WRDA, changes to the Corps policy were sought to include this authority. The policy, however, appears to restrict the delegation of the approval authority to cases where there are cost sharing arrangements in place. Where cost sharing arrangements are not required by WRDA and a land acquisition component of the project exists the project is subject to ASA (CW) approval. This opinion is based on the plain reading of the 30 November 1994 document. It may not, however, be consistent with the intent of the policy. Recommend this issue be raised through Division to Headquarters, Chief, Planning Division, Directorate of Civil Works for a more definitive answer. Further, recommend that a change to the policy be pursued to bring it in line with existing WRDA authorities. The policy, as written, is unclear regarding this issue.

3. OM Cost for 100% Federally Funded EMP Projects - The need for cost share sponsors on EMP projects is not dependent on whether there are or are not anticipated OM costs. Rather projects initiated under authorities that allow first costs to be 100% federally do not require cost share sponsors. Accordingly on projects that do not require a sponsor OM costs, whether or not anticipated, will be borne by the Government. This opinion, however, is subject to the interpretation of the Corps policy letter dated 30 November 1994, which appears to require a cost share sponsor when land acquisition is a component of the project, unless approval is obtained from the ASA (CW).

4. Island Creation - Land created by a EMP project, whether 100% Federally funded or through a cost share arrangement will, in most cases, belong to the state where the land is situated.

5. Questions should be directed to the undersigned at ext. 8192.

WINSTON J. JACKSON, JR.
Assistant District Counsel

APPENDIX M

FS/PRP/PDA COMPARISON

SUMMARY OF RECOMMENDED PLAN CONSISTENCY WITH ORIGINAL FACT SHEET AND PRELIMINARY RESTORATION PLAN (PRP)

CONSISTENCY CRITERION	APPROVED FACT SHEET 26 Apr 99		APPROVED PRP 22 AUG 00		PDA REPORT	
1. Without project condition	Schenimann Chute has been degraded by sedimentation, and without action, will become part of the adjacent land, thus eliminating an important habitat component of the open river ecosystem.		Schenimann Chute has a degraded ecosystem due to siltation and the old dikes, which now obstruct low water, flow into the side channel. Natural feeding habitat of Federally endangered pallid sturgeon may have been degraded by prior river alterations for navigation. USFWS believes that side channel restoration projects may be critical to the continued existence of this species. *Changes: Increased emphasis on pallid sturgeon*		Schenimann Chute will become part of adjacent landmass during the next 50 years. An important habitat component of the aquatic ecosystem will be lost. Natural feeding habitat of Federally endangered pallid sturgeon may have been degraded by prior river alterations for navigation. USFWS believes that side channel restoration projects may be critical to the continued existence of this species. *Changes: None*	
2. Total project cost increases (>25 percent) or decreases (>50 percent)	$1,214,000		$1,214.000 *Changes: None*		$2,768,400 *Changes: (+128% Cost Increase or +$1,554,400)*	
	Facilities	$720,000	Facilities	$720,000	Facilities	$2,088,399
	Lands & Damages	$96,000	Lands & Damages	$96,000	Lands & Damages	$10,000
	Construction Management	$75,000	Construction Management	$75,000	Construction Management	$230,700
	Planning & Design	$200,000	Planning & Design	$200,000	Planning & Design	$230,700
	Contingencies	$150,000	Contingencies	$150,000	Contingencies	$208,840
	TOTAL	$1,241,000	TOTAL	$1,241,000	TOTAL	$2,768,400

CONSISTENCY CRITERION	APPROVED FACT SHEET 26 Apr 99		APPROVED PRP 22 AUG 00		PDA REPORT	
3. Changes in project design (e.g. significant changes in location, number, or type of structures)	Notching Existing Stone Dikes (3)	$70,000	Notching Existing Stone Dikes	$70,000	Notching Existing Stone Dikes	$19,740
	Dikes/Hard Points Construction (15)	$300,000	Dike/Hard Points Construction	$300,000	Stone Hardpoints Construction (72,300 Ton)	$578,400
	Stone Revetment (5,800 feet)	$230,000	Stone Revetment	$230,000	Stone Revetment (81,300 Ton)	$772,350
					Stone Chevron (20,900 Ton)	$188,100
	Dredging (75,000 CY)	$120,000	Dredging (75,000 CY)	$120,000	Dredging (210,450 CY)	$529,809
			Changes: None		*Changes: More detailed design and costs analyses indicated that the original PRP costs had been underestimated. From PRP to PDA costs declined for dike notching 70%, increased 90% for dikes/hard points construction, increased 230% for stone revetment, Increased 340% for dredging, Chevrons are a new project feature, and the real estate costs have essentially dropped out.*	
4. Changes in estimated outputs (e.g. changes in quantity disproportionate to changes in cost and changes in quality, or the types of habitat to be restored)	Project would improve aquatic habitat diversity by moving sediment, reducing bank erosion, creating scour holes and plunge pools and deepening the downstream connection with the river. Deep water would provide off-channel habitat for over wintering, spawning and rearing of fishes, and resting/feeding sites for migratory birds and other wetland species.		Project is anticipated to enhance side channel connectivity to the river, and to provide improved physical and biological habitat diversity, especially for aquatic organisms. USFWS believes that side channel restoration projects may be critical to the continued existence of the pallid sturgeon.		Project is anticipated to enhance side channel connectivity to the river, and to provide improved physical and biological habitat diversity, especially for aquatic organisms. USFWS believes that side channel restoration projects may be critical to the continued existence of the pallid stugeon.	

CONSISTENCY CRITERION	APPROVED FACT SHEET 26 Apr 99	APPROVED PRP 22 AUG 00	PDA REPORT
4. Changes in estimated outputs (Continued)		*Changes: Original FS and the PRP did not make quantitative predictions of project output. Qualitatively, it is assumed that the intended outputs are the same—except that added emphasis has been given to the importance of the project as pallid sturgeon habitat.*	*Change: PRP did not make a quantitative prediction of project output. Qualitatively it is assumed that the outputs between the PRP and PDA are the same.*
5. Changes in physical scope (>25%)	See map enclosures to FS. The physical boundaries are the Schenimann Chute side channel.	See map enclosure to PRP. *Change: None.*	See PDA design plates *Change: None.*
6. Increases in LERRDs which causes the value of LERRDs to exceed 25 percent of the total project costs	$96,000 in LERRDs was estimated.	$96,000 in LERRDs was estimated. *Change: None.*	$10,000 in LERRDs has been estimated. *Change: Real estate needs dropped by $86,000.*
7. Policy Issue—Cost-sharing for Project construction	Cost-Share = 75% Federal/25% Non-Federal	Cost-Share = 100% Federal *Change: Non-federal contributions eliminated.*	Cost-Share = 100% Federal *Change: None.*

CONSISTENCY CRITERION	APPROVED FACT SHEET 26 Apr 99	APPROVED PRP 22 AUG 00	PDA REPORT
8. Policy Issue—Cost-sharing for O&M	O&M = 100% MDOC Responsibility	O&M = 100% MDOC Responsibility *Change: None*	O&M = 100% MDOC Responsibility *Change: None.*
9. Policy Issue—DPR or PDA Documentation	Recommended preparation of a DPR	Recommended preparation of a PDA *Change: DPR format changed to more expedited PDA documentation approach*	A PDA was prepared. *Change: None.*
10. Policy Issue—Cost-sharing for monitoring work	Monitoring a 100% non-federal cost	Monitoring a 100% Federal cost *Change: Reversal of cost-sharing responsibilities between federal and state sectors.*	Monitoring 100% Federal cost *Change: None. However, MVS will fund baseline monitoring for first 6 years, MDOC will monitor beyond that point.*

REASONS FOR PROJECT CHANGES

Major Change	Reason for Change
With project condition change	Increased recognition given to the endangered pallid sturgeon. Recent findings of the U.S. Fish and Wildlife Service were taken into account. Those findings indicate that side channel restoration projects may be critical to the continued existence of the pallid sturgeon
Increase in total project cost of 128%	PDA estimate is based on a more refined evaluation of design quantities and costs.
Changes in project design	The amount of stone revetment and dredging increased substantially based on team and agency discussions during the development of the PDA.
Decrease in LERRDs	A real estate determination was made that construction can be completed, and satisfactory results obtained through the use of rights-of entry rather than obtaining a permanent real estate interest.
Policy Issues—Cost-share change from 75% Federal/ 25% Non-Federal to 100% Federal for construction	Corps EMP policy is unclear on the need for a non-federal cost-share partner when the construction costs are 100% federal for endangered species. However, the District's interpretation is that there is no need for cost sharing with a non-federal sponsor on the Shenimann Chute project.
Policy Issue—Retention of allocation of O&M costs as 100% Non-Federal	Normally, Corps Projects initiated under authorities that allow first costs to be 100% Federal do not require a sponsor for O&M costs. However, MDOC is prepared to accept the O&M costs, if so required.
Policy Issue—Monitoring costs shift from 100% Non-Federal to 100% Federal.	MVS assumes that since first costs are 100% Federal, so too are the monitoring costs.
Fact Sheet (FS) changed to a Preliminary Restoration Plan (PRP)	MVS was looking for a more streamlined method to accomplish side channel projects (projects of low cost and a high degree of similarity between one project and the next). Accordingly, the District requested PRP approval from MVD to proceed with the development of a PDA, rather than the traditional DPR. The PDA concept has been used previously in the Corps' Environmental Continuing Authority Program (i.e. the Section 206 and Section 1135 programs). The PDA is a more time and cost efficient documentation--in that it combines both the planning and P&S project phases into a single document. At the time of the District's PDA request--it appeared that the cost of the PDA would be less than $2 million.

ORIGINALLY APPROVED FACT SHEET

DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80
VICKSBURG, MISSISSIPPI 39181-0080
http://www.mvd.usace.army.mil/

REPLY TO
ATTENTION OF:

CEMVD-PM-E (1105-2-10c)

15 JUL 1999

MEMORANDUM FOR HQUSACE (CECW-P), WASH DC 20134-1000

SUBJECT: Upper Mississippi River System Environmental Management Program, Schenimann Chute Side Channel Habitat Rehabilitation and Enhancement Project Fact Sheet

1. A fact sheet for the proposed Schenimann Chute Side Channel Environmental Management Program project is enclosed for forwarding to ASA(CW) for approval. Timely processing and approval is requested so that project general design work can be scheduled.

2. A letter of support from the Missouri Department of Conservation is also enclosed.

FOR THE COMMANDER:

3 Encls
(4cys)

GEORGE H. RHODES, JR.
Chief, Programs Execution Division

Printed on Recycled Paper

CEMVS-PM-N 22 April 1999

NAME OF PROJECT: Upper Mississippi River System - Environmental Management Program (UMRS-EMP), Schenimann Chute Side Channel Protection and Enhancement Project.

LOCATION: The project is located between river miles 57-63, right descending bank, approximately five miles north of Cape Girardeau, Missouri, in Cape Girardeau County, Missouri. Schenimann Chute is one of 23 side channels that remain along the 202 miles of open river between St. Louis, Missouri and Cairo, Illinois, at the mouth of the Ohio River.

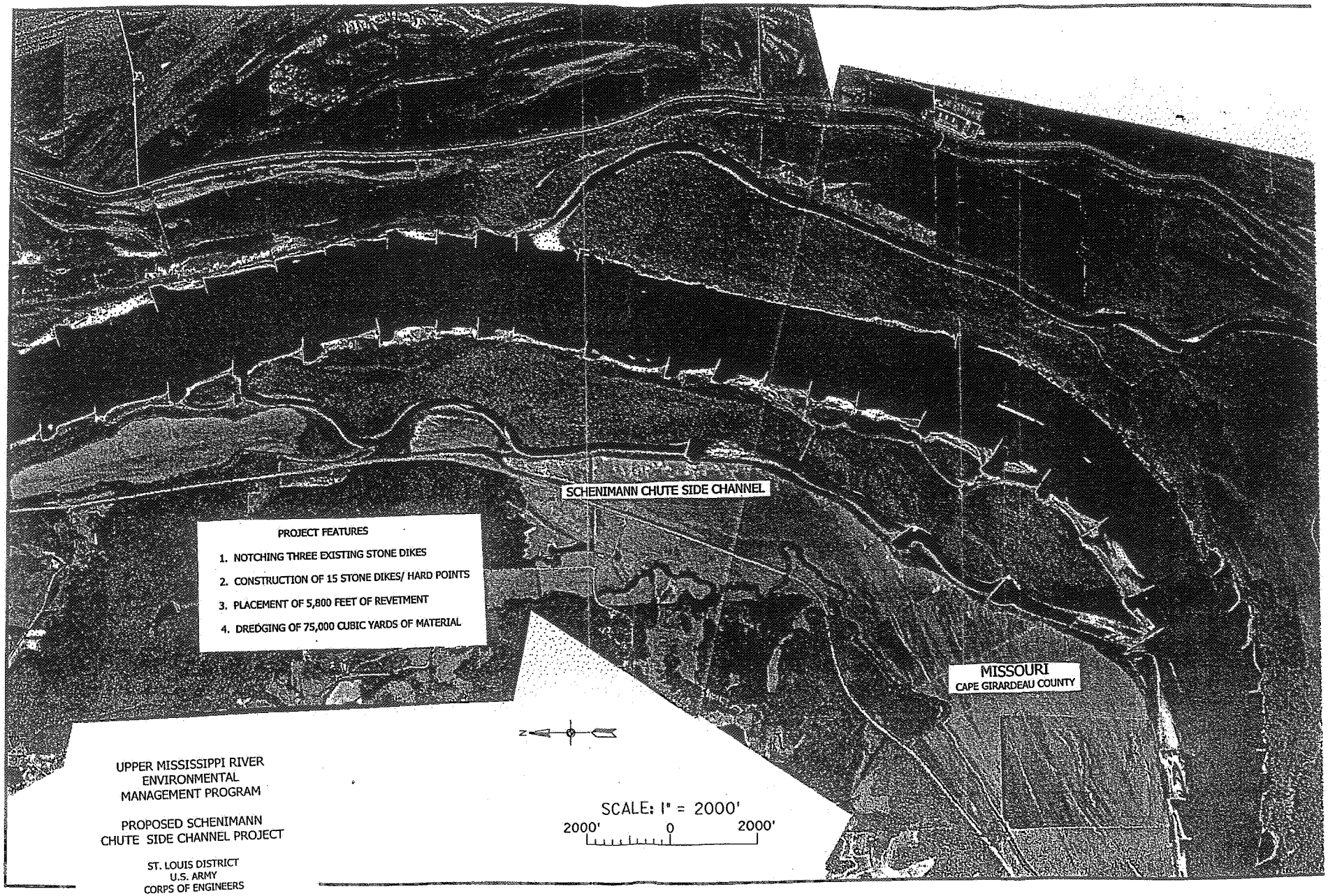
RESOURCE PROBLEM: The Schenimann Chute side channels has been degraded by the accumulation of sediment and, without action, will become part of the adjacent land, thus eliminating an important habitat component of the open river ecosystem. The side channel has been micro-modeled and habitat enhancement modifications selected.

PROJECT: The proposed project includes notching of existing stone dikes, construction of stub dikes and/or hard points, placing of revetment and dredging of approximately 75,000 cubic yards of sand at the lower end of the chute to improve connectivity with the river. Construction would occur in three phases: notching of dikes; placement of rock; and dredging of the lower end of the channel.

PROJECT OUTPUTS: The alterations would allow scouring to occur at higher flows creating holes and a sinuous flow pattern through the side channel. The project would improve aquatic habitat diversity by moving sediment, reducing bank erosion, creating scour holes and plunge pools and deepening the downstream connection with the river. The resulting deep water would provide off-channel habitat for over wintering, spawning and rearing of fishes, and resting/feeding sites for migratory birds and other wetland species.

FINANCIAL DATA: The total estimated cost of this project is $1,241,000. The estimated annual operations and maintenance cost is $10,000, which would include physical and biological monitoring. Under Section 906 (e) of the 1986 Water Resources Development Act, general design and construction of the project would be shared 75 percent Federal/ 25 percent non-Federal. Operation, maintenance, repair and rehabilitation costs would be 100% non-Federal. Land acquisition may be required to complete portions of the project. The acquisition would be completed by the non-Federal sponsor. The non-Federal sponsor would be the Missouri Department of Conservation.

Encl 1


SCHENIMANN CHUTE SIDE CHANNEL
PROJECT FEATURES
1. NOTCHING THREE EXISTING STONE DIKES
2. CONSTRUCTION OF 15 STONE DIKES/ HARD POINTS
3. PLACEMENT OF 5,800 FEET OF REVETMENT
4. DREDGING OF 75,000 CUBIC YARDS OF MATERIAL
MISSOURI
CAPE GIRARDEAU COUNTY
N
SCALE: 1" = 2000'
2000' 0 2000'
UPPER MISSISSIPPI RIVER
ENVIRONMENTAL
MANAGEMENT PROGRAM
PROPOSED SCHENIMANN
CHUTE SIDE CHANNEL PROJECT
ST. LOUIS DISTRICT
U.S. ARMY
CORPS OF ENGINEERS
APRIL 1999

M-10

Encl

MISSOURI DEPARTMENT OF CONSERVATION

Headquarters
2901 West Truman Boulevard, P.O. Box 180, Jefferson City, Missouri 65102-0180
Telephone: 573/751-4115 ◆ Missouri Relay Center: 1-800-735-2966 (TDD)

JERRY M. CONLEY, Director

April 2, 1999

Mr. Owen Dutt
Chief, Planning Division
St. Louis District
U.S. Army Corps of Engineers
122 Spruce Street
St. Louis, MO 63103-2833

Dear Mr. Dutt:

The Missouri Department of Conservation (MDC) supports the U.S. Army Corps of Engineers' Upper Mississippi River System Environmental Management Program (EMP) project study of habitat restoration at the Schenimann Chute side channel located between river miles 57 and 63, of the right descending bank of the Mississippi River, approximately five miles north of Cape Girardeau, Missouri, in Cape Girardeau County, Missouri. The project would improve aquatic habitat diversity by moving sediment, reducing bank erosion, creating scour holes and plunge pools, and deepening the lower portion of Schenimann Chute. This restoration would involve modifications including notching of existing stone dikes, construction of stub dikes and/or hardpoints, placing of revetment, and dredging of approximately 75,000 cubic yards of sand at the lower end of the chute. This work would be accomplished under the provisions of Section 1103 of the Water Resources Development Act of 1986 (PL 99-662).

If it is found environmentally and economically feasible and advisable to implement a habitat restoration project at Schenimann Chute, MDC is willing to consider entering into an agreement to provide a non-federal 25% share, (currently estimated at $310,000 which will include real estate acquisition) of the total estimated project cost of $1,241,000. MDC understands that as the project sponsor, it would be responsible for 100% of the operations and maintenance costs of the project.

MDC is willing to consider accepting donated resources (e.g., land and/or dollars) from any foundation interested in assisting with this potential EMP project.

If you need additional information from us, please contact Mr. Gordon Farabee of my staff at the above address.

Sincerely,

DANIEL J. WITTER
POLICY COORDINATION CHIEF

DJW:sf

M-11

Encl 3

COMMISSION

ANITA B. GORMAN — RANDY HERZOG — RONALD J. STITES — HOWARD L. WOOD

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
1222 SPRUCE STREET
ST. LOUIS, MISSOURI 63103-2833

REPLY TO
ATTENTION OF:
CEMVS-PM-N

26 APR 99

MEMORANDUM FOR Commander, Mississippi Valley Division
ATTN: CEMVD-PM-E

SUBJECT: Fact Sheet for Proposed Schenimann Chute Side Channel Environmental Management Program Project

1. Reference:

a. Upper Mississippi River System Environmental Management Program.

b. CECW-ZA Delegation of Approval Authority for Post Authorization Decision Documents Memorandum, dated 24 March 1999.

2. A fact sheet for the proposed Schenimann Chute Side Channel Environmental Management Program project is enclosed for review and approval by MVD. An aerial photo is furnished for your information.

3. A letter of support from the Missouri Department of Conservation is also enclosed.

4. If you have any questions or need additional information, please contact Mr. Michael Thompson, MVS Environmental Management Program Manager, at (314) 331-8039.

FOR THE COMMANDER:

Signed
GERALD W. BARNES
Deputy District Engineer for
Programs and Project Management

3 Encls

GERALD W. BARNES
Deputy District Engineer for
Planning, Programs and
Project Management

04/23/99
TAYLOR
CEMVS-PM-N

4/23/99
THOMPSON
CEMVS-PM-N

4/2
LEAKE
CEMVS-PM-F

BARNES
CEMVS-DP

Printed on Recycled Paper

CECW-PC (CEMVD-PM-E/15 Jul 99) 1st End Fitzsimmons/clf/202-761-1974
SUBJECT: Upper Mississippi River System Environmental Management Program, Schenimann Chute Side Channel Habitat Rehabilitation and Enhancement Project Fact Sheet

HQ, U.S. Army Corps of Engineers, Washington, D.C. 20314-1000

30 JUL 1999

FOR Commander, Mississippi Valley Division, ATTN: CEMVD-PM-E

The subject fact sheet is approved as the basis for proceeding into general design (preparation of a Detailed Project Report).

FOR THE COMMANDER:

Encls wd

JAMES F. JOHNSON
Chief, Planning Division
Directorate of Civil Works

CF: CECW-AR
CECW-BC
CECW-P
CECW-ZD (2)
CEMVS-PM
RTN TO: CECW-PC

APPROVED PRELIMINARY RESTORATION PLAN

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
1222 SPRUCE STREET
ST. LOUIS, MISSOURI 63103-2833

REPLY TO
ATTENTION OF:

CEMVS-PM-N

14 NOV 02

MEMORANDUM FOR Commander, Mississippi Valley Division, ATTN: CEMVD-PM-E

SUBJECT: Preliminary Restoration Plan (PRP) Approval for Upper Mississippi River System-Environmental Management Program (UMRS-EMP) Schenimann Chute Side Channel Protection and Enhancement Project

1. Request approval of the enclosed PRP for the UMRS-EMP Schenimann Chute Side Channel Protection and Enhancement Project.

2. Errata comments are enclosed that address MVD comments on the initial submission.

3. A project map and an updated fact sheet are also enclosed.

4. Due to the extended timeframe between initial submittal and final approval, a Project Management Plan has been prepared and is enclosed for your information on the current status of the project.

5. If you have any questions or need additional information, please contact Mr. Michael Thompson, MVS EMP Project Manager, at (314) 331-8039.

FOR THE COMMANDER:

Joseph P. Kellett

5 Encls

JOSEPH P. KELLETT, P.E.
Deputy District Engineer for
Planning, Programs and
Project Management

Printed on Recycled Paper

Date: 22 August 2002
Division: Mississippi Valley
District: St. Louis

Preliminary Restoration Plan

1. **Project**: Upper Mississippi River System - Environmental Management Program (UMRS-EMP), Schenimann Chute Side Channel Protection and Enhancement Project.

2. **Authorization**: Initial authorization and appropriations were provided on 15 August 1985 by the Supplemental Appropriations Bill (PL 99-88) for the Environmental Management Program. A more comprehensive authorization was provided by Section 1103 of the Water Resources Development Act (WRDA) of 1986 (PL 99-662). Subsequent WRDA language of 1992, 1996, and 1999 further modified the authorization.

3. **Location:** Schenimann Chute is located in the open river portion of the Upper Mississippi River between river miles 57-63, right descending bank. It lies approximately 5 miles north of the city of Cape Girardeau, Missouri, in Cape Girardeau County, Missouri. The chute is one of only 23 side channels that remain along the 202 miles of open river between St. Louis, Missouri, and Cairo, Illinois, at the mouth of the Ohio River. See Attachment 1 for the general location.

4. **Description of Proposed Project:**

a. The proposed project consists of: (1) cutting notches in existing old stone dikes; (2) construction of short stone dikes or hard points; (3) placement of stone revetment; and (4) dredging of approximately 75,000 cubic yards of sand at the south end of the chute. A micro-model investigation revealed that structures will create more aquatic diversity by utilizing existing flow conditions to create scour holes and a sinuous pattern through the side channel. Revetment and dikes will be placed below ordinary high water. Notching of old stone dikes will increase water flow between the closed ponds at low water. Dredging the south end of the chute will increase depth and diversity and allow for access from the river for fish to over-winter in the side channel during the low flow early winter season. The dredge material will be utilized beneficially for construction purposes (land or water) or placed in the thalweg of the river. See Attachment 2 for view of proposed project features.

b. The Mississippi River increased in width between 1824 and 1880 resulting in a decrease in depth. This width increase was due to several reasons including the cutting of timber along river banks for steamboats. By 1881Congress recognized that something had to be done to develop a dependable channel for navigation. The plan called for the reduction and (or) elimination of flows through slough and secondary side channels to confine low water discharges to the main stem of the river for

navigation. Today, the deteriorated timber dikes have been replaced with stone. Many of these dikes have outlived their designed purpose and subsequent usefulness.

c. Only 23 open river side channels exist today. Most have old dikes across them, both stone and timber, and many have silted in and the aquatic habitat diversity has been degraded. The conservation community has long recognized that side channels, chutes and other adjacent bodies of water connected to the river are important to the overall health of the ecosystem. The water bodies function as spawning, rearing, resting, feeding, and over-wintering habitat for numerous species of fish as well as important habitat for a variety of other wildlife species. The 200-mile reach of the river has lost flood plain water bodies and diversity as a result of the navigation project. Schenimann Chute is one of the side channels that has a degraded ecosystem due to siltation and the old dikes, which now obstruct low-water flow into the side channel.

d. District staff constructed an innovative moveable bed micro-model of Schenimann Chute and the adjacent main river channel. Staff from the Illinois Department of Natural Resources (IDNR), Missouri Department of Conservation (MDC), U.S. Fish and Wildlife Service (FWS), and the Long Term Monitoring station at Cape Girardeau (LTRM/MDOC) have worked with District river engineers in developing a side channel modification plan. Design considerations include increasing flow to the side channel under certain hydrographic conditions, structural changes to produce scour and plunge holes, reduction in high flow bank erosion, and providing access to the chute during low flow conditions. The model study predicts that the side channel modification is feasible and does not significantly affect the navigation channel. This plan represents a start towards the ultimate restoration of the open river side channels.

e. The Project will not require land acquisition. The Real Estate Division, St. Louis District, has researched this issue through the Office of Counsel. However, until design is complete, it is uncertain if construction right-of-way easement will be required. A comprehensive Real Estate Plan will be included in the Planning and Design Analysis Report.

5. **Consistency**: The moveable bed model study revealed that the structures created more aquatic diversity by utilizing existing flow conditions, thus creating scour holes and a sinuous pattern through the side channels. This project will not adversely impact navigation by structure modification, dredging or disposal activities.

6. **Views of the Sponsor**: MDC has expressed a willingness to participate in the project. See the attached letter of support. MDC understands that as the project sponsor, it will perform 100% of the operation and maintenance. MDC staff has been active in the preliminary planning and micro-model design work for the Project.

7. **Views of Federal, State and Regional Agencies**: IDNR and FWS, who participated in the micro-model study, fully support the plan. MDC's views are described in the attached letter of support.

8. **Status of Environmental Compliance**: District staff has noted in prior documents that side channels have been filling in over the years resulting in reduced depth, lack of aquatic diversity and loss of wetted perimeter. An Environmental Assessment will be completed. Subsequently, a FONSI or EIS will be integrated with the Planning and Design Analysis Report. The Planning and Design Analysis Report will comply with all environmental regulations, such as the U.S. Fish and Wildlife Coordination Act and the National Environmental Policy Act. It is anticipated that the Federally Endangered Pallid Sturgeon will derive benefits from the construction of this project.

9. **Costs and Benefits**: The total estimated cost of the modification is $1,241,000. The project will be 100% Federally funded due to the project's anticipated benefits to the endangered pallid sturgeon. MDC is responsible for 100% of the operation and maintenance of the project. Estimated annual O&M, including biological monitoring, is $10,000.

- Project benefits include immediate and long-term ecosystem improvements. The use of beneficial dredge material for construction or modified natural processes of dike notching/construction to provide shallow sand bottom water areas will benefit the pallid sturgeon and migratory shore birds in this stretch of the Open River. Portions of the bed of the side channel will be scoured due to notching of the old dikes. High water energy will remove materials at the end of dikes and create a meandering channel. Additional rock will provide valuable habitat for macroinvertebrates and other aquatic life. During low water, scour holes and plunge pools will be connected to the river by dredging sands blocking the chute at its downstream connection to the river. The resulting deep water will provide off-channel habitat for overwintering, spawning and rearing of fishes and resting/feeding sites for migratory birds, as well as other wetland and riverine species. Some sandbars will be created by scour/ depositional geomorphic activity and shallow/deep edges for selected species will be returned to the river environment.

- The project will potentially provide valuable habitat to the endangered pallid sturgeon (Scaphirhynchus albus). However, because pallid sturgeon are so rare, little is known about their requirements. Pallid sturgeon evolved for millions of years in natural river systems. These waters had meandering, braided channels and backwaters that provided different depths and flow velocities. Today, however, the pallid sturgeon's habitat is altered by dams that modify flows, reduce turbidity and lower water temperatures and may prevent upstream migration. It is possible that the forage base once used by pallid sturgeon has been greatly altered, thus affecting growth and reproduction. The primary forage base for adult pallid sturgeon prior to extensive modification of riverine habitats is assumed to have been flathead chubs, plains minnows, and western silvery minnows found in association with sand and gravel bars. Recent U.S. Fish and Wildlife Service findings indicate that side channel restoration projects may be critical to the continued existence of this ancient species. It is known that shallow off-channel habitats on the Missouri River have been used by young sturgeon as a refuge from the swift main channel currents. Since no models

exist for Threatened or Endangered Species, AAHU's cannot be computed for Pallid Sturgeon. During the planning process, an AHAG fish guild will be selected that the technical AHAG team feels will be representative of the pallid sturgeon.

- The project will employ a post-construction monitoring plan that will provide valuable information on the identification, documentation, modification, and enhancement of future Open River projects associated with the endangered pallid sturgeon. This monitoring plan will seek to utilize the Long Term Resource Monitoring Program (LTRMP) within the Environmental Management Program (EMP) for historical trends and post-project monitoring. The Missouri Department of Conservation will also perform monitoring protocols for this side channel project in coordination with the overall LTRMP and HREP program.

- Navigation on the Middle Mississippi River will not experience any negative impacts from this project.

10. **Implementation Schedule**:

▪ PRP Submittal	Aug	00
▪ PRP Approval	Sep	00
▪ Complete Plans and Spec	Jan	01
▪ Complete PDA	Jan	01
▪ MOA Completion	Feb	01
▪ Begin Construction	Jun	01

11. **Supplemental Information**: The concept of side channel restoration in the open river portion of the Mississippi River in the St. Louis District arose from the Avoid and Minimize Environmental Impacts Program (A&M). The A&M team has been in place in MVS since 1990. Full funding for the program began in 1996. The natural resource agencies realized that the micro-model presented an opportunity for biologists and river engineers to work together to design habitat restoration rehabilitation projects. The team modeled Schenimann Chute and developed a plan for construction at a later date. The preliminary plan was completed in 1996.

12. **Financial Data:**

Project Costs ($1,000's)

	Totals	Non-Federal	Federal	FY(00)	FY(01)	FY(02)
ERR	40	0	40	40	0	0
P&S	160	0	160	0	160	0
Construction						

1,041	0	1,041		300	741
Totals					
1,241	0	1,241	40	460	741

Non-Federal Requirements ($1,000's):

Annual OMRR&R $ 10.0

Preliminary Cost Estimate

COST ACCT.	DESCRIPTION OF ITEM	ESTIMATE
01	Lands	$96,000
06	Fish and Wildlife Facilities	$720,000
30	Engineering and Design	$200,000
31	Construction Management	$75,000
	Contingencies	$150,000
	TOTAL PROJECT COST	**$1,241,000**

COST BREAKDOWN:

PED (Includes Definite Project Report, Environmental Compliance, Plans and Specs, Project Cooperative Agreement, Engineering During Construction) $200,000

ED $73,000
RE $25,000
PM-N $67,000
CT $15,000
CO-F $5,000
PM-EA $15,000

REAL ESTATE $ 96,000

CONSTRUCTION $720,000

Notches in Stone Dikes $ 70,000

Dike Construction (Hard Point) $300,000

Revetment $230,000

Dredging $120,000

CONSTRUCTION MANAGMENT $ 75,000

CONTINGENCIES $150,000

TOTAL $1,241,000

COST SHARE SCHEDULE (100% Federal):

Federal:	$1,241,000

*Note: Estimate will be further refined during process.

MISSOURI DEPARTMENT OF CONSERVATION

Headquarters
2901 West Truman Boulevard, P.O. Box 180, Jefferson City, Missouri 65102-0180
Telephone: 573/751-4115 ◆ Missouri Relay Center: 1-800-735-2966 (TDD)

JERRY M. CONLEY, Director

April 2, 1999

Mr. Owen Dutt
Chief, Planning Division
St. Louis District
U.S. Army Corps of Engineers
122 Spruce Street
St. Louis, MO 63103-2833

Dear Mr. Dutt:

The Missouri Department of Conservation (MDC) supports the U.S. Army Corps of Engineers' Upper Mississippi River System Environmental Management Program (EMP) project study of habitat restoration at the Schenimann Chute side channel located between river miles 57 and 63, of the right descending bank of the Mississippi River, approximately five miles north of Cape Girardeau, Missouri, in Cape Girardeau County, Missouri. The project would improve aquatic habitat diversity by moving sediment, reducing bank erosion, creating scour holes and plunge pools, and deepening the lower portion of Schenimann Chute. This restoration would involve modifications including notching of existing stone dikes, construction of stub dikes and/or hardpoints, placing of revetment, and dredging of approximately 75,000 cubic yards of sand at the lower end of the chute. This work would be accomplished under the provisions of Section 1103 of the Water Resources Development Act of 1986 (PL 99-662).

If it is found environmentally and economically feasible and advisable to implement a habitat restoration project at Schenimann Chute, MDC is willing to consider entering into an agreement to provide a non-federal 25% share, (currently estimated at $310,000 which will include real estate acquisition) of the total estimated project cost of $1,241,000. MDC understands that as the project sponsor, it would be responsible for 100% of the operations and maintenance costs of the project.

MDC is willing to consider accepting donated resources (e.g., land and/or dollars) from any foundation interested in assisting with this potential EMP project.

If you need additional information from us, please contact Mr. Gordon Farabee of my staff at the above address.

Sincerely,

DANIEL J. WITTER
POLICY COORDINATION CHIEF

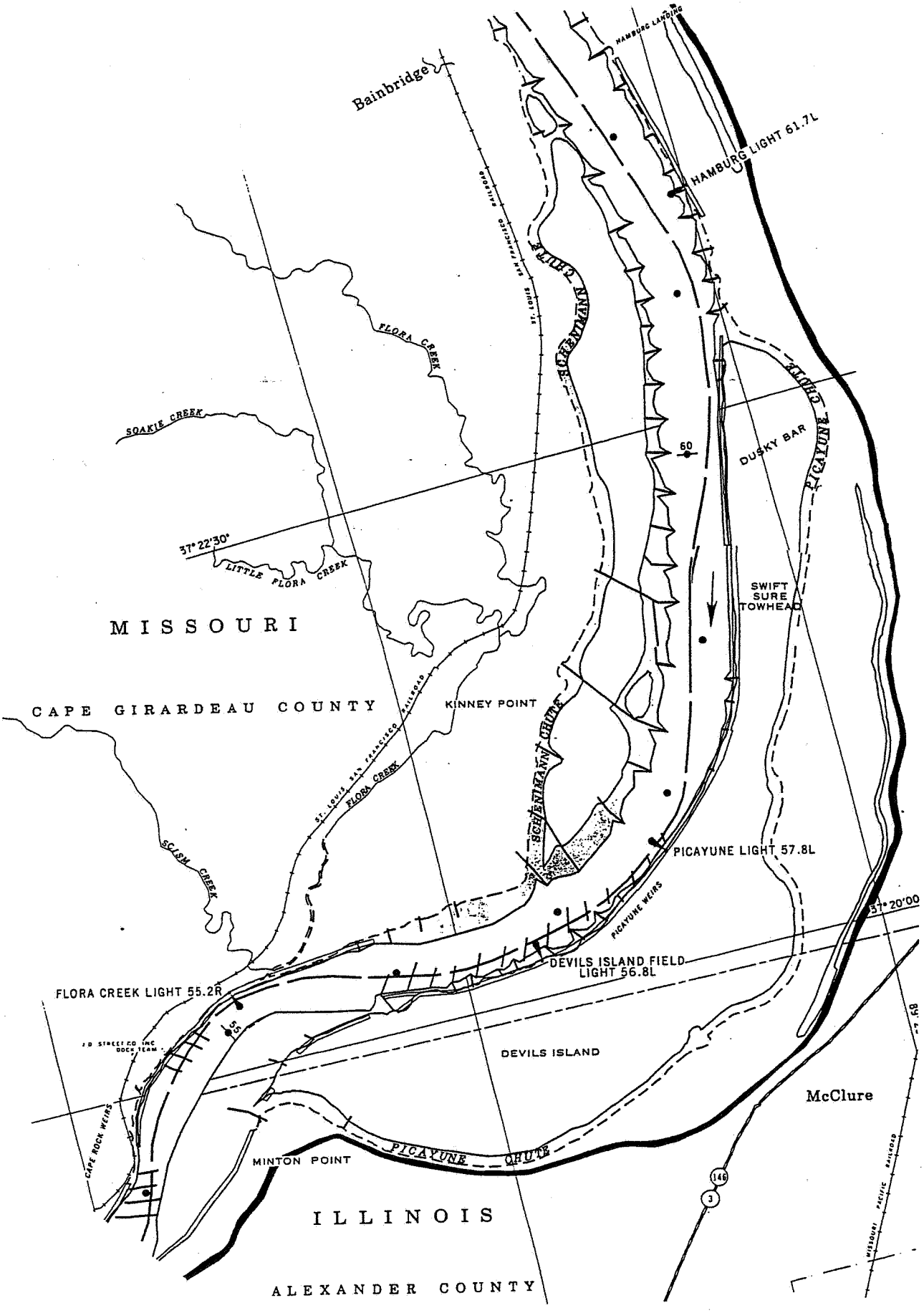
DJW:sf

COMMISSION

ANITA B. GORMAN, Kansas City
RANDY HERZOG, St. Joseph
RONALD J. STITES, Plattsburg
HOWARD L. WOOD, Bonne Terre

M-22

Schenimann Chute



a. Authorization. This section should also mention the reauthorization contained in the WRDA '99.

Response: Additional language added to Section 2, "Subsequent WRDA language has modified the authorization, these are WRDA of 1992, 1996, and 1999.".

b. Page 2, top line. "side" was omitted prior to the word "channels".

Response: The word "side" was added.

c. Page 2, last line. Until an Environmental Assessment (EA) is completed, it is premature to state that a FONSI will be prepared. The EA could conclude that an EIS is needed. This language must be changed. Also, this section should address integration of all environmental compliance actions into the Planning and Design Analysis--especially Endangered Species work since potential benefits to the pallid sturgeon are being used as the basis for 100 percent Federal funding of construction.

Response: Language was modified in Section 8 to reflect the process of performing an EA and subsequent documents. "An Environmental Assessment will be completed. Subsequently, a FONSI or EIS will be integrated with the Planning and Design Analysis. The Planning and Design Analysis will comply with all environmental regulations, such as U.S. Fish and Wildlife Coordination Act Report, and National Environmental Policy Act. It is anticipated that the Federally Endangered Pallid Sturgeon will derive benefits from the construction of this project."

d. The PRP does not address post construction monitoring. Since this will be potentially precedent setting project in that it calls for 100 percent Federal funding based upon benefits to an endangered species, it may be prudent to include a line item in the cost estimate that addresses this matter. The Corps needs to demonstrate that the project actually will benefit the target pallid sturgeon-thus the need for post construction monitoring. This project would be a good candidate for use of LTRMP funds to do the needed monitoring. I recommend that the PRP be modified to address these matters in some fashion.

Encl 2

Response: A paragraph was included in Section 9 - Cost and Benefits. Bullet number 4 outlines the general information associated with post construction monitoring. This coordinated monitoring plan with LTRMP and MDOC will eliminate a specific line item cost within the project estimate.

e. Negative benefits caused as a result of the proposed project to navigation should be analyzed and included in the report. If there are no negative impacts to navigation, the report should so state.

Response: A paragraph was included in Section 9 - Cost and Benefits. Bullet number 5 identifies the no impact implications to the navigation mission.

f. There is no mention of AAHU's as a result of creating habitat for the endangered pallid sturgeon.

Response: A paragraph was included in Section 9 - Cost and Benefits. Bullet number 3 was modified with the following language; "Since no models exist for Threatened or Endangered Species, an AAHU's cannot be computed for Pallid Sturgeon. During the planning process, an AHAG fish guild will be selected that the technical AHAG team feels will be representative of the pallid sturgeon."

g. Real estate information contained in the report is not complete. Real estate input for this report must include information specific to each respective site. The Real Estate Division must provide the real estate information along with an estimate of the cost of the right-of-way required for each site.

Response: A paragraph was included in Section 4 - Description and Proposed Project. Section 4.e outlines the current information and methodology for real estate issues and access.

DEPARTMENT OF THE ARMY
MISSISSIPPI VALLEY DIVISION, CORPS OF ENGINEERS
P.O. BOX 80
VICKSBURG, MISSISSIPPI 39181-0080
http://www.mvd.usace.army.mil/

REPLY TO
ATTENTION OF:

CEMVD-MD-PM

04 APR 2003

MEMORANDUM FOR Commander, St. Louis District, ATTN: CEMVS-PM

SUBJECT: Preliminary Restoration Plan (PRP) Upper Mississippi River System Environmental Management Program: Schenimann Chute Side Channel Protection and Enhancement Project

Subject to the following comments the enclosed PRP is approved by CEMVD as a basis for completing the Planning and Design Analysis Report.

a. Include in the PDA supplemental information provided by email on 28 January 2003, supporting the justification of the project, based on benefits associated with the pallid sturgeon.

b. Description of Proposed Project, page 2, paragraph 4.d. The last sentence of the paragraph implies we will "ultimately" reopen all the side channels, which may not be the case. Recommend the sentence be deleted.

Encl

EDWIN A. THERIOT, Ph.D.
Management Director

Printed on Recycled Paper

Gates, David R MVS

From: Laux, Eric A MVS
Sent: Monday, June 16, 2003 9:09 AM
To: Gates, David R MVS
Cc: Thompson, Mike A MVS
Subject: FW: Pallid Sturgeon & Sidechannels

side channels.doc

Here is the document from Louise Mauldin.

-----Original Message-----
From: Louise_Mauldin@fws.gov [mailto:Louise_Mauldin@fws.gov]
Sent: Tuesday, January 28, 2003 6:05 PM
To: Laux, Eric A
Subject: Re: Pallid Sturgeon & Sidechannels

Eric,
Hope the attached file will help. I didn't say anything you don't already know. Good luck. If you can keep the lower end of the side channel in the future from filling in, the side channel is going to benefit an array of native species including pallids.

(See attached file: side channels.doc)

Louise

Louise M. Mauldin
Fishery Biologist
U.S. Fish and Wildlife Service
608 E.Cherry St. Rm 200
Columbia, MO 65201
573/876-1911 ext. 118

Eric,

Here is a brief description about the Lisbon side channel and the changes that we are seeing within the side channel the last couple of years. I hope this helps. I probably did not say anything more than you already know.

The Lisbon side channel initially formed in 1993 and became a flowing side channel in Spring 1996. The upper portion of the Lisbon side channel was characterized by a braided channel with gravelly sand and fine sand substrates. The two-mile side channel was about 3 ft wide when first formed, but as it continued to evolve it was measured up to 200 ft across in some places. The middle and lower sections of the side channel were characterized by a defined thalweg and several, shallow sloping, lateral sandbars.

A flow control structure was place in the side channel in 2000 to maintain the integrity of the main channel for navigation and a low-grade control structure was placed in the lower end of the side channel to prevent head-cutting. No other hard structures were placed within the side channel so that it was allowed to meander and widen naturally across the floodplain.

From our sampling efforts, 1997-2002, we are starting to see species richness and diversity decline within the side channel. Flow in the upper portion of the chute is still pretty swift, with the gravel and coarse sand, and it still has a braided channel. Changes from our perspective have been primarily in the lower half of the side channel. Bottom and surface velocities while sampling the past two summers have been close to 0.0 m/s. The deepest hole sampled in the lower end of the side channel in 2002 decreased to about 5ft. Deeper holes sampled by our office prior to 2001 ranged from 13-16 ft. The connected or lateral sandbars where we had caught numerous young-of-the-year are now covered with several inches of silt. In fact, the silt load is so heavy in the lower end of the side channel that we are not able to trawl anymore for sturgeon.

Side channels with a diversity in habitat including depth, velocity, and substrate lend to a more diverse fish community. If sufficient flow and natural processes are allowed to occur, especially in a sizable side channel, meandering will occur, sandbars will form providing shallow water with low velocities, deeper holes will be created, and varying substrate types will appear. Restored side channels that contain diverse habitats will provide food and refuge for larval and juvenile fishes, including pallid and shovelnose sturgeon as documented in the Lisbon side channel on the Missouri River, and will provide much needed overwintering habitat for a number of species.

Gates, David R MVS

m: Laux, Eric A MVS
t: Monday, June 16, 2003 9:08 AM
Gates, David R MVS
Cc: Thompson, Mike A MVS
Subject: FW: Schenimann Chute Side Channel Endangered Species Justification

Dave,
Here is the correspondence that I have on pallid sturgeon 100% funding. I have a followup email that we recieved from Louise Mauldin (FWS, Columbia, MO) on the same day. It just reiterates what the below says.
Eric

-----Original Message-----
From: Thompson, Mike A MVS
Sent: Tuesday, January 28, 2003 3:18 PM
To: Ruff, Greg MVD; Pullen, Tom MVD
Cc: Lee, Gary J MVS; Laux, Eric A MVS; Erickson, Dan MVS; Keevin, Thomas M MVS; Markert, Brian J MVS; Dutt, Owen D MVS; Foley, Deborah A MVS
Subject: Schenimann Chute Side Channel Endangered Species Justification

Greg and Tom,

Per our telephone conference call, this supplemental information is provided for your use on the Schenimann Chute project being approved at 100% federal cost based on a threatened and endangered species (i.e. the pallid sturgeon).

Upon review, please contact me to discuss.

Thanks,

e Thompson
.4-331-8039

Schenimann Chute Side Channel - Threatened and Endangered Species Funding Justification

Policy Reasoning (Authority and Biological Opinion)
The basis for the justification of 100% Federal funding follows.

- WRDA 86, Section 1103 and Section 906.(e).(2) allows first time costs to be 100% Federal; "when such enhancement is designed to benefit species that have been listed as threatened or endangered by the Secretary of the Interior …".

- The original fact sheet outlined Schenimann Chute as a cost share project. The fact sheet was sent to MVD on 26 April 1999 and approved by HQUSACE on 30 July 1999. Based on additional information gathered by the project team, a Project Restoration Plan was submitted in August 2000 which requested a 100% federal cost to plan, design, and construction the project in support of the threatened and endangered pallid sturgeon.

- The Pallid Sturgeon Recovery Plan approved by the U.S. Fish and Wildlife Service (Service) November 7th, 1993, and the Service's Final Biological Opinion for Operation and Maintenance of the 9-Foot Navigation Channel on the Upper Mississippi River System (dated April 2000), identified past, present and ongoing loss of habitat diversity in the Middle Mississippi River (MMR) as a major factor impacting the endangered pallid sturgeon. As a result, the Reasonable and Prudent Alternative identified in that document specifically included implementation of a long-term habitat restoration program which placed high priority on the restoration of side channels and sandbars to benefit all life stages of pallid sturgeon.

- In a letter (dated 11 August 2000) that concluded formal consultation between the Corps of Engineers (Corps) and the Service, General Anderson made it clear that in light of its Endangered Species Act obligations, the Corps felt that to restore habitat in the MMR to benefit pallid sturgeon, an improved and documented understanding of the species habitat needs was of great importance. Therefore, the Corps has implemented a Pallid Sturgeon Habitat Need Study in order to identify habitat requirements for various life history stages of the pallid sturgeon and variables that may be limiting their production and distribution. In that same letter, the Corps agreed to begin "restoration pilot tests" that may reasonably be expected to benefit pallid sturgeon, to include side channel restoration, wing dam notching, gravel bar construction and chevron dike construction. Schenimann Chute would be considered a pilot tests for both side channel restoration and chevron dike construction.

Specific Habitat to Benefit Pallid Sturgeon (see attached write-ups)

- The proposed project will enhance summer flows thorough Schenimann Chute, and it is expected that water quality within the chute, such as dissolved oxygen levels, water temperature, and pH will improve, thus improving the production of small fish and invertebrates. Small fish and invertebrates are important prey items for pallid sturgeon (**U.S. Fish and Wildlife Service, 1993**). It is assumed that the survival and reproductive success of prey fish species through this restoration project will likely enhance foraging opportunities and growth of the pallid sturgeon.

- Data collected in Schenimann Chute as part of the pre-construction monitoring of the habitat rehabilitation project show that shovelnose sturgeon frequently use the scour holes below closing structures and overwinter in these areas. By creating a deep, low-velocity off-channel area in the lower portion of Schenimann Chute as proposed, it will provide potential overwintering habitat for pallid sturgeon.

- The Schenimann Chute project will increase the bathymetric and substrate diversity within the chute, and the accessibility to these habitats throughout all seasons. If pallid sturgeon are using silt or clay substrates to feed (as suggested by preliminary food habits data of LTRM-ORFS), Schenimann Chute will be able to provide year round access to an abundance of these substrates and cut banks.

- In the MMR, radio telemetry data from tagged pallid sturgeon suggest that island tips are important areas for pallid sturgeon **(Sheehan et. al., 2000).** The Schenimann Chute HREP includes measures that will extend the life of this side channel and improve habitat diversity by improving connectivity, flow and depth within the side channel. This is important for maintaining the downstream island tip habitat associated with this side channel. Under several alternatives being considered in this restoration project, a chevron dike is planned be placed at the downstream end of the project area, just downstream of the chute exit. The chevron will be used as the site for depositing dredge material, and will create a sandbar/sand island complex, enhancing the availability of island tip habitat to pallid sturgeon.

- Larval pallid sturgeon have been collected in recent years by the staff of the U.S. Fish and Wildlife Service Fisheries Resources Office in Columbia, MO in a restored side channel of the Lisbon Bottoms Unit of the Big Muddy National Fish and Wildlife Refuge on the Missouri River (U.S. Fish and Wildlife Service, 2000). While it is not known where the young sturgeon were spawned, it is known that the shallow off-channel habitats provided by the Lisbon Bottoms chute were being used by the young sturgeon as a refuge from the swift main channel currents. It can be assumed that if pallid sturgeon utilize restored side channels in the Missouri River, there is a high likelihood that they will utilize the same type of habitat in the Mississippi River.

It is recognized that specific knowledge on pallid sturgeon required habitat is limited, and it is difficult to say for sure that the Schenimann Chute project will specifically produce positive habitat gains for pallid sturgeon. Because the Corps strongly believes that any future efforts to improve habitat in the MMR to benefit the pallid sturgeon relies heavily on improved and documented understanding of the species' habitat needs, it is necessary to biologically monitor the pre and post project conditions of Schenimann Chute. It is also suggested that Salt Lake and Establishment Chute (high priority side channels), and one or two additional chute projects be implemented as additional habitat restoration pilot tests in order that we learn whether or not side channel restorations are in fact beneficial to the recovery of the pallid sturgeon. As we learn more about specific habitat needs, side channel restoration projects will be able to specifically prescribe project features that are beneficial, or focus our efforts in different directions if side channel restorations do not provide evidence of habitat benefits to pallid sturgeon.

Reference

U.S. Fish and Wildlife Service. 1993. Pallid sturgeon recovery plan. U.S. Fish and Wildlife Service, Bismarck, North Dakota. 55 pp.

Sheehan, R.J., R.C. Heidinger, K. Hurley, P.S. Wills, M.A. Schmidt. 2000. Middle Mississippi River pallid sturgeon habitat use project: Year 5 Annual Progress Report, December 1998. Fisheries Research Laboratory and Department of Zoology, Southern Illinois University at Carbondale, Carbondale, Illinois.

U.S. Fish and Wildlife Service. 2000. Pallid sturgeon recovery update, Issue No.11. Steve Krentz editor. Bismarck, North Dakota. <http://mountain-prairie.fws.gov/moriver/update00.pdf>

-----Original Message-----
From: Robert Hrabik [mailto:hrabir@mdc.state.mo.us]
Sent: Friday, January 17, 2003 12:16 PM
To: eatwood@dnrmail.state.il.us; Valerie A. Barko; Mark Boone; Danny Brown; Craig Gemming; David Herzog; Vince Travnichek; Laux, Eric A; jgarvey@siu.edu; david_ostendorf@usgs.gov
Cc: Mike Roell
Subject: Schenimann Chute habitat rehab project and pallid sturgeon

Robert A. Hrabik, Missouri Department of Conservation, Science Division, Open River Field Station, Jackson, MO 63755.
Possible effects of the Schenimann Chute habitat rehabilitation project on the pallid sturgeon in the Middle Mississippi River.

The main objectives of the Schenimann Chute habitat rehabilitation project are to increase side channel sinuosity, improve substrate diversity, alleviate water physical stratification (water temperature, dissolved oxygen, and pH), and provide a large off-channel low water velocity overwintering area.

Middle Mississippi River data collected in winter by ORFS staff suggest that larger wing dikes support larger populations of sturgeons and include catches of pallid sturgeon. Large wing dikes provide deeper water and lower water velocities, which seem to attract sturgeons. Data collected in Schenimann Chute as part of the pre-construction monitoring of the habitat rehabilitation project show that shovelnose sturgeon frequently use the scour holes below closing structures and overwinter in these areas. By creating a deep, low-velocity off-channe area in the lower portion of Schneimann Chute as proposed, it will probably provide overwintering habitat for pallid sturgeon.

Trawling data from the Middle Mississippi River strongly correlate larval sturgeon catches with lower island tips. Larval pallid sturgeons have been confirmed from these catches. The lower tip of the island is constricted by a wing dike, which may limit the use of larval sturgeons during high water in spring. Modifications to that dike as outlined in the habitat rehabilitation plan could enhance island tip use by larval sturgeons, hence larval pallid sturgeon.

Radio telemetry data from tagged pallid sturgeon in the Middle Mississippi River by staff of Southern Illinois University also suggest that island tips are important. Again, modifications to the wing dike at the tip of the island may encourage greater use of that habitat by adult pallid sturgeon.

Dave Herzog and Dave Ostendorf of the ORFS also report that material flushed from the colons of pallid sturgeon contains less sand and perhaps more silt or clay-like substances.
This could indicate that pallid sturgeon may be feeding over silt or clay substrates, possibly along cut banks or low-water velocity areas in side channels or behind wing dikes. The Schenimann Chute habitat rehabilitation project will improve fish access to the side channel and through all chambers at lower flows. If pallid sturgeon are using silt or clay substrates to feed, Schenimann Chute provides an abundance of these substrates and cut banks.

-----Original Message-----
From: Jim Garvey [mailto:jgarvey@siu.edu]
Sent: Monday, January 20, 2003 11:08 AM
To: Laux, Eric A

Cc: 'Robert Hrabik'
Subject: Schenimann Chute endorsement

es E. Garvey, Fisheries and Illinois Aquaculture Center, Southern Illinois University, Carbondale, IL 62901.

I fully endorse Robert Hrabick's assessment of the potential beneficial effects of the Schenimann Chute restoration project on the pallid sturgeon. Rehabilitation of this side channel will increase substrate diversity, increase deep-water habitat, reduce thermal and chemical stratification, and provide low-velocity habitat. Diverse, side-channel habitats are critical for many overwintering species of fish (potentially including the pallid sturgeon) and also may provide key reproductive habitat. Pallid sturgeon is piscivorous and, as noted in Hrabick's assessment, likely feeds in these low velocity areas in which prey fish reside. Hence, facilitating the survival and reproductive success of prey fish species through this restoration project will likely enhance foraging opportunities and growth of the pallid sturgeon.

As also pointed out in Hrabick's missive, our group has found that tagged pallid sturgeon frequent island tips in the Middle Mississippi River. Modifications to the wing dike at the island tip may well enhance habitat availability for pallid sturgeon adults.

-----Original Message-----
From: Joyce_Collins@fws.gov [mailto:Joyce_Collins@fws.gov]
Sent: Tuesday, January 21, 2003 9:46 AM
To: Laux, Eric A
Subject: Schenimann Chute HREP and pallid sturgeon
Importance: High

Joyce A. Collins, Assistant Field Supervisor, U.S. Fish and Wildlife Service, 8588 Route 148, Marion, IL 62959
lephone: 618/997-3344, ext. 340
: 618/997-8961
ail: joyce_collins@fws.gov

Eric,

Here is the information reqeuested. As I stated previously, I believe our Draft Fish and Wildlife Coordination Act Report pretty well laid out the benefits of this project to pallid sturgeon.

The Fish and Wildlife Service's Final Biological Opinion for Operation and Maintenance of the 9-Foot Navigation Channel on the Upper Mississippi River System (dated April 2000), identified past, present and ongoing loss of habitat diversity in the Middle Mississippi River as a major factor impacting the endangered pallid sturgeon. As a result, the Reasonable and Prudent Alternative identified in that document specifically included implementation of a long-term habitat restoration program which placed high priority on the restoration of side channels and sandbars to benefit all life stages of pallid sturgeon.

Research to date confirms and supports the importance of river habitat diversity to this endangered fish. The Schenimann Chute HREP includes measures that will extend the life of this side channel and improve habitat diversity by improving connectivity, flow and depth within the side channel. This is important for maintaining the downstream island tip habitat associated with this side channel. This type of habitat has proved to be important to all life stages of pallid sturgeon (reference information from research and monitoring by SIUC, MoDOC-LTRM station and USGS). Such habitat diveristy also improves conditions for the production of aquatic macroinvertebrates and small fish that are important prey items for pallid sturgeon. Although specific documented use of side channels by pallid sturgeon is rare (I believe the LTRM station have collected pallids below the closing structure in Marquette side channel), this is largely due to inaccessiblity of these areas by both the fish and researchers during periods of moderate to low flow. Improved access and depth within the side channels will provide seasonal refugia for pallid sturgeon. Finally, the construction of a chevron with sand island will

provide additional sandbar habitat for all life stages of pallid sturgeon and also contribute to aquatic macroinvertebrate and small fish production.

FISH AND WILDLIFE SERVICE
Marion Illinois Suboffice (ES)
8588 Route 148
Marion, IL 62959
(618) 997-3344

September 21, 2001

Colonel Michael R. Morrow
U.S. Army Corps of Engineers
St. Louis District
1222 Spruce Street
St. Louis, Missouri 63103-2833

ATTN: Mr. Eric Laux, CEMVS-PM-EA

Dear Colonel Morrow:

This letter constitutes our Draft Fish and Wildlife Coordination Act Report (DFWCAR) for the Schenimann Chute Habitat Rehabilitation and Enhancement Project (HREP). Schenimann Chute is located in Cape Girardeau County, Missouri, between Upper Mississippi River miles 63.0 and 57.0, a part of the Middle Mississippi River (MMR). This report is intended to provide partial compliance with Subsection 2(b) of the Fish and Wildlife Coordination Act, (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), and Section 7 of the Endangered Species Act of 1973, as amended.

The Schenimann Chute HREP is a component of the Upper Mississippi River System Environmental Management Program (EMP) originally authorized by Section 1103 of the Water Resources Development Act (WRDA) of 1986. The goal of EMP is to implement "numerous enhancement efforts . . . to preserve, protect, and restore habitat that is deteriorating due to natural and man-induced activities." Section 906 of WRDA 1986 states that such habitat restoration projects can be funded at 100 percent federal cost share for endangered species. The Schenimann Chute HREP is being constructed to enhance habitat diversity for the benefit of the endangered pallid sturgeon. It also provides additional habitat benefits for the endangered least tern, threatened bald eagle and many other large river fish species.

INTRODUCTION

Schenimann Chute side channel complex extends along a 6-mile stretch of the Upper Mississippi River, between river miles 63.0 and 57.0. The chute is located 5 miles north of the town of Cape Girardeau, Missouri. Schenimann Chute provides vital backwater habitat for fish and wetland species. Some of the functions provided include spawning, rearing, resting, feeding and over-wintering habitat.

Historical Survey Maps of the Mississippi River dated 1908 indicate this reach of river contained substantial habitat and depth diversity. Important habitats included Picayune Chute, Devil's Island and Chute, Swift Sure Towhead and numerous small sand and willow islands. Schenimann Chute did not exist at the time. Aerial photographs from 1932 and 1935 depict newly constructed river training structures (wingdams) on both the Missouri and Illinois banklines (USACE 2000). Thus, Schenimann Chute was created as a result of sediment accretion between these river training structures. In addition, Swift Sure Towhead has accreted to connect with

Devil's Island. The many small sand and willow islands in the area have been eliminated and the original Picayune Chute has disappeared. With ongoing sediment accretion between wingdams and the loss of many small sand islands, the result has been an overall net loss of habitat diversity in this river reach.

A sedimentation study was completed in order to evaluate a number of environmental design alternatives and modifications in the Schenimann Chute complex. The study utilized a physical hydraulic micro-model as a means to aid environmentalists, biologists and engineers in creating more diverse physical and ecological habitats throughout the study reach. The results of this study are summarized in a report by the Corps of Engineers (Corps) dated May 2000.

RESOURCE PROBLEMS AND OPPORTUNITIES

The MMR historically had a meandering pattern and shifted its course over the years, leaving oxbow lakes and backwaters (Theiling 1999). The undeveloped river was shallow and characterized by a series of runs, pools and channel crossings that provided a diversity of depth (Theiling 1999). In 1824, the MMR surface area totaled 109 mi^2 (87.2% riverbed, 12.8% islands) (Simons et al. 1974). In 1796, Collot (1826) surveyed the river and mapped 55 side channels. His historical account describes a very dynamic system with the capability to create and maintain a diversity of habitat types. In describing the great potential for change in the MMR, Collot wrote:

"The Mississippi River has not only the inconvenience of being of an immense extent, of winding in a thousand different directions, and of being intercepted by numberless islands; its current is likewise extremely unequal, sometimes gentle, sometimes rapid; at other times motionless; which circumstances will prevent, as long as both sides remain uninhabited, the possibility of obtaining just data with respect to distances. But an insurmountable obstacle will always be found in the instability of the bed of this river, which changes every year; here a sharp point becomes a bay; there an island disappears altogether. Further on, new islands are formed, sandbanks change their spots and directions, and are replaced by channels; the sinuosities of the river are no longer the same; here where it once made a bend it now takes a right direction, and there a straight line becomes a curve; here ravages and disorders cannot be arrested or mastered by the hand of man, and it would be extreme folly to undertake to describe them, or to pretend to give a faithful chart of this vast extent of waters, as we have done for the course of the Ohio, since it would not only be useless but dangerous."

Today, the natural meandering processes of the MMR have been altered through channelization. Wingdams, revetments, closing structures and bendway weirs have fixed the channel in place, disrupting the dynamic processes that create and maintain a diversity of habitat types. By 1968, the river surface area had declined to 100 mi^2 and the river width to an average 3200 feet (Simons et al. 1974). Today only 25 side channels remain (USACE 1999b). Recent studies by Theiling et al. (2000) indicate that river surface area and width continues to decline and side channels continue to be lost.

The objective of the Schenimann Chute HREP is to increase environmental diversity in the area by forming more shallow and deepwater environments along with maintaining areas with both fast and slow current. Proposed actions to enhance the chute include cutting notches in existing stone dikes, installation of hard points, placement of stone revetment, dredging approximately 75,000 cubic yards of sand at the south end, and placement of a chevron south of the chute. Notching dikes is expected to increase flow during periods of low water, thereby enhancing connectivity. Placement of 15 hard points is expected to form scour holes and induce sinuosity within the channel. Stone revetments are planned to be installed below ordinary high water. Dredging sand from the south end will increase depth and physical diversity and offer access to over-wintering habitat for fish during times of low flow. Placement of the chevron near the south end of the chute offers shallow water and island habitat with flow diversity.

THREATENED AND ENDANGERED SPECIES

To facilitate compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies are required to obtain from the Fish and Wildlife Service (Service) information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed action. The following list of species have ranges that include the concerned area:

Classification	Common Name	Scientific Name	Habitat
Threatened	Proposed to be delisted	Bald eagle	*Haliaeetus leucocephalus* Breeds and winters along major rivers and large reservoirs
Endangered	Indiana bat	*Myotis sodalis*	Caves mines; small stream corridors with well developed woods; upland forests
Endangered	Least tern	*Sterna antillarum*	Bare alluvial and dredge spoil islands
Endangered	Pallid sturgeon	*Scaphirhynchus albus*	Rivers

There is no designated critical habitat in the project area at this time.

The bald eagle is listed as breeding and/or wintering in counties bordering the MMR. During the winter, this species feeds on fish in open water areas including those created by dam tailwaters, the warm water effluents of power plants, municipal and industrial discharges, or in power plant cooling ponds. The more severe the winter and the greater the ice coverage, the more concentrated the eagles become. They roost at night in groups in large trees adjacent to the river in areas that are protected from the harsh winter elements. They perch in large shoreline trees to rest or feed on fish. Bald eagles nest in large trees with an unobstructed view of the surrounding area. Two bald eagle nests are located in the vicinity of the project area. A nest was observed in 1998 just upstream at approximate river mile 66.5 on the Illinois side of the river. Another nest was observed in 1998 downstream on Marquette Island at approximate river mile 49.0. The eagle may not be harassed, harmed, or disturbed when present nor may nest trees be cleared.

Indiana bats are considered to potentially occur in any area with forested habitat. Indiana bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines. Females form nursery colonies under the loose bark of trees (dead or alive) and/or cavities, where each female gives birth to a single young in June or early July. A maternity colony may include from one to 100 individuals. A single colony may utilize a number of roost trees during the summer, typically a primary roost tree and several alternates. Some males remain in the area near the winter hibernacula during the summer months, but others disperse throughout the range of the species and roost individually or in small numbers in the same types of trees as females. The species or size of trees does not appear to influence whether Indiana bats utilize a tree for roosting provided the appropriate bark structure is present. However, the use of a particular tree does appear to be influenced by weather conditions such as temperature and precipitation. During the summer, the Indiana bat frequents the corridors of small streams with well-developed riparian woods as well as mature upland forests. It forages for insects along stream corridors, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of crop lands, along wooded fence rows, and over farm ponds and in pastures. It has been shown that the foraging range for the bats varies by season, age and sex and ranges up to 81 acres (33 ha). To avoid impacting this species, tree clearing activities should not occur during the period of April 1 to September 30. If it is necessary to clear trees during this time frame, mist net surveys may be necessary to determine if Indiana bats are present.

The least tern occurs in several counties along the Mississippi and Ohio Rivers. It nests on bare alluvial or dredge spoil islands and sand/gravel bars in or adjacent to rivers, lakes, gravel pits and cooling ponds. It nests in colonies with other least terns and sometimes with the piping plover. This species forages in shallow water areas along the river and in backwater areas, such as, side channels and sloughs. Foraging habitat must be located in close proximity to nesting habitat. Least terns are known to nest downstream of the project area on Marquette Island. It must not be harmed, harassed or disturbed when present.

Forbes and Richardson (1905), Schumulbach et al. (1975), Kallemeyn (1983), and Gilbraith et al. (1988) describe the pallid sturgeon as being a fish well adapted to life on the bottom in swift waters of large, turbid, free-flowing rivers. Pallid sturgeon evolved in the diverse environments of the Missouri and Mississippi Rivers. Floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters formed the large-river ecosystem that provided macrohabitat requirements for pallid sturgeon and other native large-river fish. These habitats were historically in a constant state of change. Mayden and Kuhajda (1997) describe the natural habitats to which the pallid sturgeon is adapted as: braided channels, irregular flow patterns, flooding of terrestrial habitats, extensive microhabitat diversity and turbid waters.

The historic floodplain habitat of the Missouri and Mississippi Rivers provided important functions for the native large-river fish. Floodplains were the major source of organic matter, sediments and woody debris for the mainstem rivers when floodflows crested the river's banks. The transition zone between the vegetated floodplain and the main channel included habitats with varied depths described as chutes, sloughs or side channels. The chutes or sloughs between the islands and shore were shallower and had less current than the main channel. These areas provide valuable diversity to the fish and probably served as nursery and feeding areas for many aquatic species (Funk and Robinson 1974). The still waters in this transition zone allowed organic matter accumulations, important to macroinvertebrate production. Both shovelnose sturgeon and pallid sturgeon have a high incidence of aquatic invertebrates in their diet (Carlson et al. 1985, Gardner and Stewart 1987). Floodflows connected these important habitats and allowed fish from the main channel to utilize these habitat areas to exploit available food sources.

PROPOSED PROJECT FEATURES

The preferred plan for the Schenimann Chute HREP includes five parts: (1) cutting notches in existing old stone dikes and a pile dike, (2) construction of hard points, (3) construction of stone revetment, (4) dredging the lower end of the chute, and (5) construction of a chevron south of the lower end of the chute. A total of nine alternatives were considered with various combinations of the above listed features.

METHODOLOGY

The Schenimann Chute wildlife and fishery habitats were analyzed by using a combination of the Aquatic Habitat Appraisal Guide (AHAG) and the Fish Habitat Appraisal Guide (FHAG). The target species analyzed included the shovelnose sturgeon, paddlefish, sauger, smallmouth buffalo and flathead catfish. Habitat Suitability Index models were developed for the river otter and false map turtle to determine project impacts on wildlife species. Existing conditions, future without project conditions and future with project conditions were examined. This analysis employed an interagency team with members representing the Missouri Department of Conservation, the Corps and the Service.

The evaluation models utilized produce a rating of habitat quality for each respective habitat type or species. This rating is referred to as a Habitat Suitability Index (HSI). The HSI, a value ranging from 0.1 to 1.0, measures the existing and future habitat conditions compared to optimum habitat which is 1.0. This value, when multiplied by the available habitat within the project area, will provide a measure of available habitat quality and quantity known as habitat units.

Each analysis includes limiting factors in each matrix. Absence of critical life requisites for a particular species makes the habitat unsuitable and results in a HSI value of 0.1 regardless of other habitat characteristic scores. Average annual habitat units (AAHU's) for each species are calculated to reflect expected habitat conditions over a 50-year project life. The following analysis is based on data provided by the Corps.

EXISTING AND FUTURE WITHOUT PROJECT CONDITIONS

A number of assumptions were made about what the project area and vicinity would be like 25 and 50 years in the future without any project. One assumption was that at 25 years in the future there would only be a spring connection between Schenimann Chute and the Mississippi River. At 50 years in the future the side channel would be totally disconnected from the river. The substrate and depth would become increasingly homogenized.

In the future without project condition, Schenimann Chute will become essentially unsuitable as riverine habitat for the fish species analyzed. Habitat quality for the river otter will decline in the future without project condition, essentially becoming unsuitable. Habitat quality for the false map turtle will also decline, but not to a significant degree.

FUTURE WITH PROJECT CONDITIONS

A number of assumptions were also made concerning the future with project condition. These include maintaining and improving flow and connectivity until 25 years into the future. At 50 years in the future, sedimentation will once again restrict flow and connectivity in the side channel. The same assumptions apply to depth diversity in the side channel.

The preferred alternative (Alternative 7) will result in a net benefit of 8259 AAHU's for the fish species analyzed. This reflects a weighting factor to express the benefits of the chevron to be constructed at the lower end of Schenimann Chute. Habitat conditions remain unchanged for the river otter. Habitat conditions will improve slightly for the false map turtle with a total project benefit of 41 AAHU's with Alternative 7. Overall, the proposed project will result in a net gain of 8300 AAHU's for all species analyzed.

CONCLUSIONS AND RECOMMENDATIONS

The proposed project will be beneficial to the Middle Mississippi River by improving habitat diversity in this river reach. The project will enhance and improve depth diversity, flow and connectivity in an important side channel. Aquatic organisms will gain access to important habitat for several life stages, such as spawning, rearing and overwintering. This area will also provide an important feeding area for many species and serve as a production area for small fish and invertebrates that other species feed upon. Increased depth diversity and improved flow should elongate the life of this side channel and improve water quality. For these reasons, the project will improve habitat for the endangered pallid sturgeon and provide additional habitat for the endangered least tern, the threatened bald eagle and other large river fish species.

The habitat evaluation models utilized are useful tools for conducting incremental cost analysis. However, none of the models can truly reflect the benefits to fishery resources in the area. The proposed project supports aquatic ecosystem restoration and is in accordance with the Service's goals of habitat restoration and enhancement in the MMR. Therefore, we fully support the construction of the Schenimann Chute HREP at the earliest possible date. Thank you for the opportunity to provide this Draft Fish and Wildlife Coordination Act Report.

Sincerely,

Joyce A. Collins
Assistant Field Supervisor

cc: MoDOC (Christoff, Hrabik, Boone)
IDNR (Stuewe, Atwood)
USFWS (Steinbach, Surprenant)

LITERATURE CITED

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APPENDIX N

CUMULATIVE IMPACTS ASSESSMENT

APPENDIX N

CUMULATVE IMPACT ASSESSMENT OF THE UMRS-EMP HABITAT REHABILITATION AND ENHANCEMENT PROGRAM

Prepared by the Environmental Analysis Branch
St. Louis District, Corps of Engineers
January 2001

This document attempts to assess the readily quantifiable cumulative impacts of habitat projects implemented under the Habitat Rehabilitation and Enhancement component of the Environmental Management Program (EMP) for the Upper Mississippi River System (UMRS). Cumulative impact is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time" (Council on Environmental Quality, 1987).

Background. The EMP was established by the 1986 Upper Mississippi River Management Act (within 1986 Water Resources Development Act (WRDA)) and was reauthorized in 1999. When the program was first established, it was scheduled to expend $189.6 million over a 15-year period (1988-2002) for habitat rehabilitation and enhancement (EMP-HREP) projects on public lands that lie in and along the Mississippi River from St. Paul, Minnesota, to Cairo, Illinois, and several of its major tributaries, including the Minnesota and Illinois Rivers. When EMP was reauthorized in 1999, the program was extended indefinitely, and was authorized to the funding level of approximately 33.0 million per year to cover all of its major programs, including $22,750,000 for the HREP program, however, the program has not been funded to the authorized level to date. In general, HREP's are proposed by the states of Minnesota, Wisconsin, Iowa, Illinois, and Missouri and the U.S. Fish and Wildlife Service (FWS), developed and designed by interagency planning teams, and engineered and constructed by the Corps of Engineers (St. Paul, Rock Island, and St. Louis Districts). The Rock Island District is responsible for administration of the EMP-HREP program.

The goal and objectives of the EMP HREP program include 1) restoration, protection, and enhancement of critical aquatic, wetland, and floodplain habitat types throughout the UMRS, 2) monitoring the habitat projects in order to learn how to better future restoration efforts, 3)improving communications and expanding partnership among the many UMRS management agencies, interest groups, and the general public, and 4) being a model program to other similar river systems and water resource management programs

Because impoundment and river regulation for navigation have significantly modified the hydrologic regime and the pattern of sedimentation, the most pervasive environmental problem on the UMRS is sedimentation. Most projects are designed to counteract side channel and backwater sedimentation, and generally involve dredging and alteration of flow patterns with riverine structures, construction of enclosed levee systems with pumping facilities for water level control, or island construction.

Existing NEPA documentation for EMP-HREP Projects. For every EMP-HREP project, a site-specific planning document is prepared which includes NEPA documentation. An environmental assessment (EA) is prepared to determine if an EIS is needed. Probable impacts of project alternatives on all significant physical, biological, cultural, social, and economic resources are described. Cumulative impacts are addressed, but often briefly. General information pertaining to each HREP project, and for some projects, full planning documentation reports, can be obtained at the following links:
St. Paul
http://www.mvp.usace.army.mil/enviro_protection/umrs_program/
Rock Island
http://www.mvr.usace.army.mil/EMP/hrep.html
St. Louis
http://www.mvs.usace.army.mil/pm/Project%20Menu/District%20Map%20Page%20with%20Hotspots.htm#top_of_list_of_projects

A programmatic environmental impact statement or EIS has not been prepared for the entire EMP-HREP program, however, a habitat needs assessment (HNA) has been completed in support of the UMRS EMP. The EMP HNA was designed to help guide future HREP's on the UMRS. To identify habitat needs, historical, existing, forecast, and desired future conditions were compared at the system, reach, and pool levels. To accomplish the HNA, a GIS tool and a new floodplain vegetation successional model were developed. These tools allow geomorphic and land cover characteristics to be translated into the potential habitat areas for species to occur. The HNA detailed report, and summary report, can be accessed via the Internet at the following web address:
http://www.umesc.usgs.gov/habitat_needs_assessment/emp_hna.html.

Limitations/observations concerning this cumulative impact assessment. Because of a number of factors, the scope and degree of detail contained in this assessment are limited.

1. Cumulative impacts on physical and biological resources within the UMRS will be addressed in this assessment. Effects on cultural, social, and economic resources, which are not the focus of the EMP-HREP program, are not addressed.

2. This assessment is based primarily upon EMP-HREP data maintained and provided by the Rock Island District Corps of Engineers from which the EMP program is managed, and the United States Geological Service (USGS) Upper Midwest Environmental Science Center (UMESC), who is partnered with the Corps of Engineers for the collection and analysis of long term monitoring data collected by the Long Term Resource Monitoring Program (LTRMP), whose day to day activities are managed by UMESC. The data consists of a list of projects by status as of the end of 2001, as well as a summary of project outputs for each District.

3. The systemic effects information concerning EMP- HREP impacts is very limited, and there are inconsistencies in this data among the Districts. For example, the description or classification of habitats improved by EMP-HREP projects is not uniform. Because the HNA was recently conducted, uniformity should improve in the near future based on the broadly accepted geomorphic and land cover classifications, and improved accessibility of GIS information. In

contrast, the collection of administrative and budgetary data for the EMP-HREP program has been standardized for quite some time now.

4. This assessment was prepared by the St. Louis District, with limited input from the St. Paul and Rock Island Districts. Full participation from all three Districts, although desirable, was not possible given other priorities. Also, time limitations of staff within the St. Louis district are also restrictive to the amount of detail that is feasible for such a project. The St. Louis District intends to include this assessment in all future planning reports for St. Louis EMP-HREP projects. In the future, this assessment will undergo periodic updates to reflect the change in status of projects, as well as known changes concerning ecological status of projects and the river. The District also intends to coordinate periodically with the Rock Island and St. Paul Districts to make further improvements in the description of cumulative impacts.

5. The "past, present, and reasonably foreseeable future" EMP-HREP projects correspond to the three project status categories used in the tables in this assessment. Past projects are those already constructed or in the process of being constructed, present projects are those in the design or current planning phases, and future projects are those ideas that have been proposed and discussed amongst agencies as projects that may be planned for in the future, but have not yet entered into any formal planning phase.

6. The scope of this assessment is limited to the EMP-HREP program. A full assessment of cumulative impacts in the UMRS could very well include other Corps of Engineer programs, such as maintenance and operation of the navigation system, management of Corps lands adjacent to the navigation project, and the permitting of construction activities in waters of the United States through the regulatory program, but this is not feasible at this time. Currently there is a navigation study ongoing that will produce a cumulative impact assessment based on the impacts of the UMRS navigation system. Likewise, this assessment could include habitat management and restoration activities in the UMRS by others such as the FWS and states, and environmental regulatory programs implemented by such agencies as the Environmental Protection Agency (EPA) but this too was not feasible.

7. The assessment of cumulative impacts is very compatible with an ecosystem approach to resource monitoring, project planning, and resource management. The ecosystem perspective is new to the Federal government within the last 10 or so years, and implementation of this approach is still in its infancy.

Past Condition and Historic Change of UMR Habitat.

This section, and basic river landscape conditions in the current condition and future condition sections below have been summarized or directly taken from the HNA Summary Report (2001) and the HNA Technical Report (2001). For detailed information and further reading, please feel free to view these documents at the following web address:

http://www.umesc.usgs.gov/habitat_needs_assessment/emp_hna.html.

Information on historic land cover have come from U.S. Government Land Office maps and survey notes of the 1800's. This source provides a good coarse level basis for interpretation of historic land uses/land cover, but usefulness is limited to coarse interpretation as mapping methods of the early 19th century lack the precision of methods used today.

Prior to widespread European settlement of the region, the UMR Basin was a diverse landscape of tallgrass prairie, wetlands, savannas, and forests. Human activities over the past 150 years (agriculture, urban use, etc.) have resulted in the present landscape that is highly developed. Because of the human induced changes in the UMR, plant communities do not reflect their former distributions, and animal populations and ranges have been effected to some degree, leading to Federal threatened or endangered status for some.

Northern river reaches of the UMR were more forested and were composed of mixed silver maple forests, seasonally flooded backwaters, floodplain lakes, marsh, and prairie. Beginning around the northern Iowa border and along the lower Illinois River, grasslands and oak savanna dominated floodplain plant communities, and forests had a greater component of oaks and other hardmast trees. Below the Kaskaskia River, the floodplain was heavily forested with species characteristic of southern bottomland hardwood communities. Impacts of river floodplain development include forest loss and open water gain in northern reaches, and grassland and forest losses in the rest of the UMRS with a major conversion to agricultural use. (Table 1). Agricultural development and levee construction around the turn of the 20th Century eliminated native communities and decreased the lateral connectivity of the river. Levees currently protect about 3% of the floodplain in pools 1-13, 50% of the floodplain in pools 14-27, 80% of the floodplain in the open river portion of the Mississippi (below pool 26), and 60% of the Lower Illinois River reach (Figure 1). Levees cut floodplain areas off from frequent flood events are thought to have changed much of the natural river processes that involve floodplain interactions, such as exchange of nutrients and nutrient assimilation, the seasonal aquatic connections that played important roles in providing temporary habitats for feeding and rearing to fish species in the UMR, and seasonal hydrology important in providing highly productive food plants and invertebrates for nesting and rearing, and resting waterfowl and other aquatic birds.

(From HNA Technical Report, Section 3.1, pp 24-31) - Land cover community change differs throughout the UMRS. Pools 13, 17, 22, 24, 25, and 26 show similar magnitude and type of change (Table 1). Pool 4 is unusual among other UMR pools in that Lake Pepin, a natural main stem lake, dominates Pool 4 land cover. Water is the dominant cover type in the landscape, and the proportion of water remains very similar after impoundment. Marsh habitats were small components of the landscape in both time periods, but their percent composition increased fourfold in the later time period. The amount of prairie remained similar, but the amount of timber was halved. Loss of much of the Timber was caused by inundation caused by dam construction, development and agriculture.

The increase in the open water class between pre-settlement and 1989 in Pool 8 (150%) far exceeds that of any other pool presented. Impoundment by navigation dams flooded most of the lower one-half of the pool and killed most of the terrestrial plants, as occurred to some degree with most of the pools in this region. The proportion of timber in Pool 8 dropped 38%. Some was likely lost to development (11%), but the remainder was likely flooded and killed or swept away

as islands eroded. Sediment accumulation and littoral (i.e., wind and wave) processes in the navigation pools of the northern reaches have greatly altered aquatic habitats. Marsh area was reduced by about one-half, but prairie area increased slightly. Agriculture is a small component of the landscape in pool 8, but the proportion of developed area is highest among all the reaches.

Pool 13 experienced very little change in the proportion of open water in the early and late time period. The increase in open water impounded area in the lower end of the pool may have been balanced by loss of aquatic area elsewhere in the pool. The area of marsh habitats increased from only 4.5% to 18.3% of the Pool 13 area, probably in response to the creation of shallow aquatic areas in the lower pool and loss of depth in backwaters that allowed emergent plant growth. Prairie area was reduced from 35% of the area to 5%. Most of the area was likely converted to agriculture, which occupies about 32% of the contemporary floodplain. Impacts of development and inundation reduced timber area in Pool 13 by one-half (~40% to ~20%).

The proportion of open water area in Pool 17 increased from 15% to 25% of the Pool 17 area between pre-settlement and 1989 periods. The change is difficult to detect in plan form view, but there appears to be a slight widening of the channel areas, no large impounded or backwater areas were created. Marsh area increased very slightly, but it is a very minor component of the reach in both periods. Prairie area decreased from 57% in the presettlement period to only 7% the latter time period. Much of the area was converted to agriculture, which occupies about 30% of the modern floodplain area. Timber area increased slightly in the later time period, perhaps encroaching into former prairies. Developed area displaced about 5% of the pre-settlement communities.

Pool 22 lost a small proportion of aquatic area between pre-settlement and contemporary periods. The marsh class was absent in the early period and barely present in the modern era. Prairie had been a substantial component of the pre-settlement landscape at 35% of the reach, but it was reduced to only 4% of the modern landscape. Timber occupied more than one-half of the floodplain in the pre-settlement era, but was reduced to 12% of the floodplain area in 1989. Most of the former prairie and timber was converted to agriculture, which occupies more than 70% of the modern landscape. Floodplain development is a very minor component of the modern landscape.

Pool 24 has developed similarly to Pool 22. The proportion of the Pool 24 floodplain classed as open water decreased slightly between the pre-settlement modern eras. Marsh area, a small landscape component in both periods, increased in the latter period. Prairie was the dominant land cover class in the pre-settlement era at 46% of the floodplain area. It was largely converted to agriculture, and only 3.3% of the floodplain was classed prairie in 1989. Timber was the second most prominent land cover class in pre-settlement Pool 24, covering about 40% of the floodplain. Logging and agricultural clearing reduced timber cover to only 13% of the modern floodplain area. Floodplain development is a very minor component of the modern landscape.

Open water was a larger component of the pools 25 and 26 floodplain landscape than pools 22 and 24, but the changes over time are similar in these reaches. The open water class area changed very little between pre-settlement and contemporary periods. Marsh area was a small landscape component in both time periods, but it did increase in the latter period. Prairie was, again, the

major landscape component at 46% of pre-settlement floodplain area, but it was reduced to only 6% of the contemporary floodplain area. Agricultural conversion displaced most of the pre-settlement prairie and currently occupies over 50% of the floodplain area. Timber area was reduced from 35% of the pre-settlement floodplain to about 20% of the modern floodplain area. The degree of development was slightly higher at 3.1% of modern floodplain area than pools 22 and 24, but lower than the northern pools.

The lower portion of the UMR Open River reach (river miles 0-80) supported a much different pre-settlement environment than the northern river reaches. The pre-settlement landscape was almost completely forested, with timber covering 87% of the landscape and forested swamp covering 6% of the floodplain. Open water was the only other land cover class, occupying 7% of the pre-settlement floodplain area. Open water in the modern era was reduced to about one-half of its pre-settlement proportion of the floodplain (6.9% to 3.6% of floodplain area). The loss is because of narrowing of the channel and loss of secondary channels. Agriculture is the dominant cover type in the modern era, occupying about 70% of the floodplain area. Timber covered about 20% of the floodplain in 1989, but most was restricted to islands and the land between the river and set back levees. Prairie occurs in 1989 as a landscape component in leveed areas.

The Illinois River below the Great Bend at Hennepin, Illinois differs from the Mississippi River in that it is a very low gradient river. The pre-settlement river in the La Grange reach had many backwaters of various degrees of connectivity with the main channel compared to the Mississippi River. Open water increased slightly in the modern era, but importantly, the distribution of the water changed from numerous small lakes to several very large open backwater areas. The marsh component of the landscape decreased slightly in the contemporary era. Prairie occupied about 20% of the pre-settlement floodplain areas, and still accounts for 10% of the floodplain area. Timber fringing channels and backwater lakes was the dominant pre-settlement cover type, occupying almost 60% of the floodplain. Levee construction and agricultural conversion reduced timber cover to 23% of the modern floodplain area. Swamp areas present in the pre-settlement era were absent in 1991. Agriculture behind protective levees occupies about 45% of the modern landscape.

Current Conditions

Overall Land Cover

(From HNA Summary Report) - The UMRS floodplain area encompasses over 2.6 million acres. Agriculture is the dominant land cover class, occupying about 50 percent of the floodplain. Open water is the second dominant land cover class, covering 17 percent of the floodplain. Floodplain forests follow closely, occupying 14 percent of the floodplain. None of the other classes exceeds 10 percent of the floodplain area, and only developed land areas exceed 5 percent (Table 2).

Land cover classes are unevenly distributed throughout the river system, and the absolute floodplain area of river reaches and pools may also differ greatly. An analysis of long-term change in several broad habitat classes helps assess general change over time. When examining existing conditions, or managing for discrete habitat or species, attention to fine details of habitat may be more appropriate.

Grassland

The review of historic ecological change presented earlier clearly demonstrates the loss of grassland land cover from Iowa to southern Illinois. The extent of grassland fragmentation and conversion are the most extreme changes in many parts of the UMRS. Grassland patch connectivity has been highly reduced, and connectivity to other natural habitats has been reduced where agriculture or development are adjacent to grassland patches.

Forest

(See Figure 2) Forest was and remains an important component of the floodplain landscape for many reptile, amphibian, bird, and mammal species. Contemporary forests are distributed differently and have different species composition than in the past. They are even aged and have low tree species diversity. Changes in response to river and floodplain development differ among geomorphic reaches. Floodplain forests in northern pooled reaches were replaced mostly by water impounded by dams and also by development. Forests remaining in the upper pooled reaches have species composition similar to the past. In the southern pooled reaches, the lower Illinois River, and the Open River south to the Kaskaskia River, open forests and grassland-oak savannas joining dense riparian forests and grasslands were eliminated, but riparian forests remain largely intact. In the Open River south of the Kaskaskia River, the floodplain was once almost completely forested, but was later cleared and levees were constructed to protect crops.

Marsh

(See Figure 2) Marsh fragmentation is difficult to assess because river marshes were not well mapped in early periods and they are inherently fragmented along backwater margins, wet meadows, and river banks. Generally, contemporary marsh communities are more abundant in northern river reaches than in southern reaches, where there are few backwaters, river water is turbid, and sediment quality is poor. Marsh patches are so small and widely separated in southern river reaches that they can barely even be seen at this map scale. There is greater absolute acreage of marsh habitat in northern pooled reaches, and the proportion of total floodplain area is very much greater, because the northern reaches have less total area than southern reaches (Fig. 14). In other words, marsh habitats are more abundant, widely distributed, and common in northern river reaches.

Agriculture

(See Figure 2) Croplands currently occupy about one-half of the total UMRS floodplain area, and agriculture is the dominant land cover class. Cropland distribution is skewed toward southern river reaches where levees protect the wide fertile floodplains (see figure 2). Agriculture is the largest continuous land cover class in the lower 500 miles of the UMR and the lower 200 miles of the Illinois River. Grasslands once occupied most of the current agricultural land, but forested areas were also converted to crops.

Connectivity

Seasonal flooding is an ecologically important process in large river floodplain ecosystems because it connects the river with its floodplain. In the UMRS many low elevation floodplain areas are no longer subject to seasonal flooding because they are permanently flooded from impoundment by navigation dams. Comparing pre-dam and post-dam, total open water area has

decreased or remained stable in Pools 5a, 6, 14 to 25, the Open River, and the Illinois River, but it increased in Pools 4, 5, 7 to 13, and 26.

Stability implies that dams had little effect on the plan form outline and amount of open water area. Decreases in water area are attributable to several geomorphic processes including: loss of contiguous backwaters, filling of isolated backwaters, loss of secondary channels, filling between wing dams, and delta formation. Increases in water area are apparent where dam impacts inundated significant amounts of low elevation floodplain in lower pool areas.

Connectivity of UMRS aquatic habitats has also been modified by dams that block fish migration on the mainstem rivers and up into tributaries. Flood control and hydroelectric dams block access to over one-half of the length of tributary streams and rivers. Fish use tributaries for spawning and to seek refuge from harsh flow or water quality conditions on the main river. Upper Mississippi River System navigation dams are used to maintain low flow navigation, so the dams were constructed to allow high flows to pass freely through the dams with all gates open. Locks and dams 1 and 19 present nearly complete barriers to upriver fish migration because they are also hydroelectric dams with high fixed crests. The other dams are open from 1 to 30 percent of the time, which provides some opportunity for upriver fish passage.

Fragmentation

Natural habitats are highly connected south of Minneapolis to Clinton, Iowa, because there is abundant public land (Figure 1). However, discontinuity in the distribution of public lands and levees has resulted in significant habitat fragmentation south of Rock Island and along the lower Illinois River. The riparian forest remains fairly contiguous in a narrow band along the longitudinal gradient of the rivers, but large tracts of other native floodplain terrestrial communities only remain as remnants in the national wildlife and fish refuges and state conservation areas.

Diversity

Habitat diversity is a measure of the different types of habitats, their size, and their relative abundance in a defined area. Habitat diversity can be calculated for both land cover and geomorphic areas. Land cover diversity is highest along Minnesota, Wisconsin, and northern parts of Illinois and Iowa. Pools 1 to 4, 14 to 19, and the Illinois River have moderate diversity. Pools 1 and 15 are highly urbanized, Pool 18 and Alton Pool are highly agricultural and have incomplete data. Pool 20 and southward have the lowest Agriculture is an obvious low diversity environment but even natural communities such as this sedge marsh can have few species. A more diverse marsh supports many different types of herbaceous and woody plants. diversity scores. These lower reaches are highly developed for agriculture. Geomorphic area diversity follows a pattern very similar to land cover diversity.

Floodplain and Aquatic Areas

Geomorphic areas, or aquatic and terrestrial features within river reaches, are parts of the river system that have similar geologic origins, formed by similar river processes or manmade structures. They include channel, backwater, and floodplain areas. Aquatic areas are either

contiguous (connected with the river) or isolated (normally not connected with the river). Similarly, floodplain areas are either contiguous or isolated from the river by levees. The geomorphic area data are limited to UMR Pools 4 through 26, the La Grange Pool, and the Cape Girardeau LTRMP study reach. The summary of the reach from Lake Pepin to St. Louis, Missouri shows that about 40 percent of the total floodplain area (including both aquatic and floodplain areas) is leveed, but levees are concentrated south of Rock Island, Illinois (Figure 1). This figure closely approximates the amount of agriculture in the floodplain. The distribution of leveed areas as proportion of total floodplain area is about:

- 3 percent north of Pool 13;
- 50 percent from Pool 14 through Pool 26;
- 80 percent in the Open River; and
- 60 percent of the lower 160 miles of the Illinois River.

Contiguous floodplain susceptible to seasonal flooding constitutes about 23 percent of the floodplain area system-wide. Islands are about 8 percent of the floodplain area, bringing the total terrestrial area to about 70 percent of the floodplain from Minneapolis to St. Louis.
The range of the proportional contribution of aquatic area types was 10 to 70 percent of the total river floodplain area, which is indicative of the geomorphic variability among river reaches and the differing effects resulting from impoundment. Backwater aquatic area classes are more prominent in the northern pooled reaches, and channel habitats are more prominent in the southern pooled reaches.

Cumulative impacts. Cumulative impacts addressed in this assessment include: Summary of HREP projects, habitats affected, target animal groups, distribution of project sites within the UMRS, proportion of UMRS floodplain affected by projects, bottomland forest affected, and effects of project levees

Summary of HREP projects in the UMRS. The main problems facing habitats on the UMRS today include tributary effects of increased inflows of nutrients and sediment, decreased interaction of the floodplain with the main river, decreased structural diversity due to island erosion, sedimentation, and leveed floodplain, and alterations to hydrology of the floodplain due to altered water levels in the pools. Table 3 provides an overview of the projects that are constructed, being constructed, or are in the planning or design phases (moving toward construction), the general habitat problems of each of the projects, the methods incorporated for fixing the problem, and the general animal groups of focus. From this table, it can be seen that HREP projects have focused on utilizing several key methods for counter acting the effects of the above problems. These have included:

- Backwater Dredging - Create or restore overwintering fish habitat and depth diversity;
- Water Level Management (Dikes and Water Control Systems) - Reduce sediment deposition in backwater and wetland areas and manipulate water levels to promote aquatic plant and invertebrate production, and restore waterfowl resting and feeding habitat;

- Islands - Restore aquatic and migratory waterfowl habitat by providing physical conditions necessary for the re-establishment of aquatic plant growth and reduce wind and wave action;
- Shoreline Stabilization - Prevent shoreline erosion and create fish habitat;
- Secondary Channel Modifications - Preserve aquatic habitat by reducing sedimentation in backwater areas;
- Aeration - Restore aquatic habitat by improving water quality;
- Other (e.g., dike or wing dams alterations, potholes, land acquisition) - Complement to one of the other project types.

Of the 58 projects listed on table 3, 57 % utilized dredging to some extent to increase depths or reconnect main channel to off channel habitats, 40% incorporate construction of levees and other structures that allow for independent water level management or protection from sedimentation, 28% included shoreline stabilization, 24% involved island restoration or protection.

As of February 28, 2002, a total of 77 sites in UMRS either already completed or under construction, in the planning or design phase, or identified as possible future sites, but not yet initiated (Table 4, Figure 3). There are 32, 22, and 23 projects within the St. Paul, Rock Island, and St. Louis Districts, respectively (Table 5.). Two of St. Paul's projects are phased or divided into two parts, and these phases have been treated as separate project sites in this assessment. The Mississippi River Bank Stabilization project, which expands across pools 6 through 10 in the St. Paul District, was treated as one site because no details were available for each pool.

Of all the sites that are currently completed or under construction, the St. Paul District tends to have the smallest sites (average about 600 acres), and the Rock Island District the largest (average about 2,400 acres). Sites in the St. Louis District average about 1,700 acres. However, sites in all three Districts range widely in size, from as small as 20 acres to as large as 7,300 acres. Table 2 shows the clear tendency within the St. Paul District that sites already constructed or under construction are the smallest, sites that are in the design and planning phase are intermediate in size, and possible future sites are the largest. This tendency holds true for the Rock Island district as well, except that the projects average size within the design and planning phase are skewed upwards due to the potentially large impact area of the Pool 11 Islands project (approximately 9900 acres). Among the sites that lie within the St. Louis District, the tendency appears to be just the opposite. There has been a shift of focus from implementing projects in only the pooled portion of the district (sites above Mississippi River Mile 200) to both the pooled and open river portion of the district. In the open river, the major habitat focus tends to be toward restoring aquatic side channel habitat, which relatively speaking, tend to be smaller in size (footprint) than the projects that take place within the floodplain terrestrial and aquatic zones. Also in the open river, the Stone Dike Alteration project and Least Tern Project, which both will attempt to alter habitat by altering river structures and dredged material, are planned to affect the river in phases throughout the lower 200 miles of the UMR. Both of these projects have not had acreage estimated as it is impossible to do at this point, but it is clear that the projects will impact large areas when all phases are completed.

There are 113,661 acres of aquatic and terrestrial habitats within all 77 EMP-HREP project sites, for which habitat conditions are expected to improve as projects continue to be implemented and

ideas for projects continue to be conceived. Table 6 and 7 present existing land use/land cover type (1989 land cover) percentages and acreages respectively at each of the projects with defined boundaries. Some projects, such as Swan Lake and Batchtown, include features in adjacent upland areas for the control of soil erosion. These upland areas are not reflected in the tables.

Habitats affected. Over all, most habitats affected by EMP-HREP projects are aquatic (Table 6 and 7). In all the districts, the selected HREP sites tend to have land cover mainly consisting of open water and floodplain forest, and generally 5% or less of the project sites consisting of other vegetation cover types. In the St. Paul District, HREP sites mostly tended toward open water, submersed and floating leaved aquatic vegetation, and bottomland forest. Rock Island shows the same tendencies for cover type as St. Paul, but a greater proportion of land cover is in floodplain forest. The St. Louis District again shows open water being the dominant cover type, but the HREP sites have very little in the way of submersed and floating leaved aquatic vegetation, with more vegetation consisting of floodplain forest. The tendencies of different cover types within each of the districts HREP sites tend to agree with the overall cover types that were presented in the HNA, with the northern UMRS pools (1-14) tending to have the greatest abundance of sub-aqueous and floating leaved vegetation and a lack thereof in the southern portion, and a fair proportion of all pools consisting of floodplain forest. The amount of agriculture as a proportion of the total floodplain that is very evident as occurring in the southern part of the UMRS (south of pool 18) in the HNA analysis is not evident within the project boundaries. This is partly due to the fact that the HREP sites to date have occurred on lands that are managed by either the USFWS or State natural resource agencies or occur within the lowest elevations of the floodplain least favorable to farming. While there is some occurrence of farmland on these properties, the management of the land is for the most part for natural floodplain vegetation species, particularly moist soil plant production.

Land cover/ land use changes for pre and post project conditions have not been completed for all of the EMP projects to date, but two examples have been completed for this assessment to demonstrate cause and effect relationships of HREP projects to land cover. The sites were chosen based on the availability of recent data, and to display two different but common restorations that occur under the EMP program. One site is the Pool 8 islands restoration phase 1 and 2, and the other is Dresser Island in Pool 26, which is a water level control type of project. While the utility of vegetation to suggest change can be somewhat misleading when seasonal effects are taken into account, the data presented here appear to show project related changes irrespective to season.

The Pool 8 phase 1 project (initiated in 1989 and completed in 1992) restored and constructed three islands totaling 13,000 feet long to reduce wave action in the backwater area in order to maintain existing valuable habitat and provide conditions necessary for the re-establishment of aquatic plant beds in approximately 1000 acres of backwater habitat. This phase can be seen in the area outlined in red on the left (west) side of Figure 4. Phase 2 of the project (initiated in 1997 and completed in 1999) consisted of building seven islands totaling 26 acres in size and about 11,000 feet long to reduce wave action in the backwater area in order to maintain existing valuable habitat and provide physical conditions necessary for the re-establishment of aquatic plant beds and deepwater habitat. Phase 2 is the area outlined on the right (east) side of Figure 4. It can be seen in the figure that the open water land cover type has been reduced indirectly

proportional to submersed aquatic plant beds, which was the overall physical change expected within the boundaries of both phases of the project.

The Dresser Island project, which was completed in 1991, included the construction of a low level berm around the perimeter of the project site, and incorporated water control structures which were to allow controlled flooding of the separate management units of the site. The changes shown for Dresser in Figure 5 are much less obvious than those shown for the Pool 8 islands project. This is due to several factors, including the flood of 1993 and 1995 having great impacts to the Dresser Island site, and that the photos used to determine 2000 land cover/land use were less accurate for the purposes of determining land cover/land use than in previous years. The photo accuracy can be attributable to what seems to be a major change in 1994 of wet floodplain forest to cottonwood forest, and back to wet floodplain forest in 2000. The main project related change that can be seen is the decrease in permanently flooded aquatic plants (Floating-Leaved Aquatic Bed and Semi-permanently Flooded Emergent Perennial classes) and an increase in seasonally flooded plant communities (Seasonally Flooded Emergent Annuals and Perennials classes). While highly varying temporal changes may be a major factor in the resulting vegetation at a site from year to year, it appears that the Dresser Island project has resulted in some of the benefits expected during the planning phase. An analysis of annual duck use days taken between 1991 and 1998 appear to show expected increased use that would result from the types of vegetation classes that have resulted from the project.

Target animal groups. Animal species are typically chosen as the targets or recipients of intended habitat improvements. Waterfowl and fish have been the focus of many EMP- HREP projects, mainly because the public lands to which these projects are confined are already under management by state or Federal natural resource agencies. In many instances the primary management responsibilities of these agencies as mandated by law are focused upon waterfowl and fish, with waterfowl often times receiving a greater emphasis in practice. Threatened and endangered species such as the bald eagle usually are included in management directives also, as are migratory birds. The waterfowl-fish dichotomy is reflected in Table 3. A count of the number of project sites targeted toward both waterfowl and fish is approximately 50% of all the projects (31 of 58). Eighteen, or about 30%, of the 58 project sites include measures targeted toward improving habitat conditions for mainly UMR fish species, and nine, or approximately 15% are primarily targeted towards waterfowl or other migratory water birds. Animals other than waterfowl and fish have been mentioned as the targets of project objectives. For example, Table 3 also includes categories for furbearers, migratory birds, or other wetland species. While these groups of species are targeted in these habitat improvements, it is mainly for purposes of providing cost benefit analysis for planning projects, meaning that these are the particular species that are available for evaluation within the Wildlife Habitat Appraisal Guides (WHAG), or Aquatic Habitat Appraisal Guides (AHAG) that are typically used by managers in the UMR to forecast habitat improvements. It is generally assumed that building projects that restore river function or habitat features will be beneficial to the overall ecosystem, or at least not be detrimental to other species of the UMRS. For example, habitat analyses conducted by the St. Louis District for the Pharrs, Stump, Swan, Cuivre, Calhoun and Batchtown projects reflect a net positive gain in fisheries and wildlife. For these five projects, the cumulative impact to target fisheries groups or species (including mussels) is +2,024 average annual habitat units (AAHUs). For these same five projects, +3,206 AAHUs of habitat benefits will accrue to target wildlife

species. Habitat benefits in terms of AAHUs were not computed for the Clarksville or Dresser projects because they predated the implementation of the habitat unit methodology. Similar data for the St. Paul and Rock Island Districts are not included, but general information and some detailed habitat evaluation information can be found at the websites mentioned in section "Existing NEPA documentation for EMP-HREP Projects" above.

Distribution of EMP-HREP project sites within the UMRS. Table 4 and figure 3 shows that EMP-HREP projects are distributed rather uniformly throughout the UMRS, but there are gaps in the system where projects are not located. Of the projects that are constructed, under construction, or in the planning and design phase, there are two project sites on the Minnesota River, six on the Illinois, and fifty-six project sites on the Mississippi. The most significant gap is the lower 201 miles of the Mississippi River, from Lock and Dam 26 at Alton, Illinois to Cairo. This reach includes pool 27 and the open river. The scarcity of existing public lands along this river segment is the main reason for the lack of EMP-HREP projects. Other gaps are to the north, and include pools 2-3, 12, 15, and 19- 20 on the Mississippi. (From St. Paul to Alton -from mile 847 to mile 201 -there are 25 pools on the UMR, each one averaging about 26-river miles in length). Like the open river, there are no projects in pool 2 because of a scarcity of public lands. The gap in pool 3 is due to the combination of a scarcity of public lands, and the current lack of interest by the Minnesota Department of Natural Resources to cost share EMP-HREP projects on a considerable amount of state-owned land. Pools 12, 15, 19 and 20 are mainly in privately held lands. Until the land would become available, projects will not occur in those sites. In the gap below pool 26 (lower UMR) it is expected that more projects will be built within the reasonably foreseeable future as there has been much interest amongst the partner agencies and non-governmental organizations to restore side channel habitats, and there is expected to be significant purchases of land by the USFWS to expand the Mississippi River Wildlife Refuge. It is reasonable to expect that as EMP-HREP projects become more numerous and more closely distributed throughout the UMRS, synergistic effects will occur ("the whole is greater than the sum of *its* parts"). At the present time, there is no methodology available to quantify this anticipated effect.

Proportion of UMRS floodplain affected by EMP-HREP Projects. The outline of the UMRS floodplain can be used as the boundary of the ecosystem in which EMP-HREP projects lie. Table 8, contrasts the approximately113,000 acres (177 square miles) of all 77 projects identified in Table 5 (not all have been constructed yet) with the full floodplain of the UMR (Illinois River and all of the UMR), which covers about *2.65* million acres (or about 4100 square miles). About 4.5% of the total UMRS floodplain, from bluff to bluff, has been or will be affected in terms of habitat improvements. Following Corps District boundaries, projects in the St. Paul, Rock Island, and St. Louis districts affect about 8.1%, 5.5%, and 2.1% of the total floodplain respectively, or about 3.7% if viewed over the UMRS as a whole. If acres of the floodplain are broken down into only "natural" habitats (all coverage excluding developed or agriculture cover types), the percentage of habitats affected is 9.4%, 9.5% and 5.4% for the St. Louis District, or 8.2% of the entire UMRS. This increases between percentages of whole floodplain and natural floodplain affected is primarily due to the HREP projects being limited to restoring portions of the floodplain that were already being managed by the Fish and Wildlife Service or State natural resource agencies, i.e., were not under extensive agricultural use. It also indicates that the projects have primarily focused on rehabilitating existing habitat rather than converting agricultural or developed areas back into more natural habitats. It is clear that the EMP-HREP

program has affected a small area within the larger ecosystem. The HREP projects represent areas that benefits can be readily quantified. It is likely that some areas outside of but adjacent to project sites will also improve as a result of their proximity. Aquatic habitats are probably more likely to receive such "side benefits" than terrestrial ones. Project boundaries within aquatic areas are more often delimited artificially or arbitrarily, and not tied to any discrete environmental gradient, unlike terrestrial project sites, which can be represented by islands or blocks of bottomland forest surrounded by cropland, for example. Although there is no methodology available to quantify these additional areas, it is unlikely that the cumulative total would approach the magnitude of the area already quantified.

Bottomland forest. Of the St. Louis District's EMP-HREP project areas that have been completed or are under construction to date (Swan Lake, Stump Lake, Dresser Island, Calhoun Point, Cuivre Island, Batchtown, Stag Island, Clarksville Refuge, Pharrs Island) 8,303 acres of 18,100 acres or about 46% consist of wet floodplain, Salix (maple), or Populus (cottonwood) forest communities (Table 7). These 8,303 acres comprise about 12 percent of the forested UMRS floodplain of pools 24, 25, 26, and Alton Pool, which is a small proportion (reference Table 2 for floodplain land cover acres per pool). Six percent or 482 acres of the 8,303 forested acres were or will be mechanically cleared to construct project features. Another 252 acres of bottomland forest will be cleared by other methods. These 734 acres represent about 1 percent of the pools 24, 25, 26, and Alton Pool forested floodplain in the St. Louis District. In contrast, 618 acres of tree plantings are proposed at St. Louis sites. About half of these plantings consisted of converting floodplain cropland to bottomland forest, and the other half involved planting trees within forest killed by the flood of 1993. Overall, area of forest cleared exceeds area of tree planting by 116 acres, or about two percent of the pre-project forested area within project boundaries. The 116-acre difference represents about .2% of the total bottomland forest within pools 24, 25, 26, and Alton Pool forested floodplain. Tree species composition of bottomland forest cleared at project sites varies within and among project sites, and consequently the value to wildlife of cleared forest varies. It has been useful in the St. Louis District to differentiate between bottomland forest supporting hard mast tree species, such as oaks and pecan, from bottomland forest that does not. The latter areas typically support silver maple, willow, and cottonwood, and they are lower in elevation with reference to the river than areas with mast trees. A rough estimate of the proportion of forest supporting hard mast species that is or will be cleared versus total forest cleared at St. Louis EMP-HREP project areas is 40 percent. Fragmentation of bottomland forest has or will occur at six St. Louis projects, chiefly as a result of clearing for construction of a riverside dike/levee. Forest fragmentation has been viewed as a chief factor associated with the decline of interior forest nesting birds, including Neotropical migrants. However, the fragmentation at St. Louis sites is minor because the long relatively narrow band of trees removed is not located within the middle of a block of forest, but typically parallel to the river, and set back about 100-200 feet from the riverbank. The width of clearing usually varies from 75 to 180 feet, depending upon whether borrow areas are sited adjacent to the levee or not. At Stump Lake, clearing width in some segments has reached up to 215 feet. When possible, tree clearing has avoided very large trees that provide potential habitat for eagle perching, heron rookeries, feeding, etc. Project plans to convert cropland to bottomland forest by tree planting at Cuivre, Calhoun, and Batchtown will over time increase the extent and continuity of floodplain forest. Plantings at these sites will also be made up of mostly hardmast species, planted on existing ridges or slightly elevated berms in order to increase forest diversity and food for many species of wildlife. The cumulative impact of St. Louis' habitat projects on bottomland

forest is minor. Quantitative data describing bottomland forest impacts for the Rock Island or St. Paul District have not been included due to time constraints.

Effects of project levees. The Clarksville, Dresser, Stump, Swan, Calhoun, Batchtown, Pharrs and Stag Island projects in the St. Louis District all involve the construction of a low riverside dike/levee around the perimeter of the project area. This feature is typically built to the 3- or 4-year frequency flood elevation. The levee provides benefits to aquatic habitats in a variety of ways. It reduces the rate of sedimentation in the protected area, thus prolonging the life of existing backwater areas. By excluding minor flooding, interior water levels can be better managed, thereby increasing the predictability of providing food resources for wetland wildlife, such as migratory waterfowl and shorebirds. Also, low levees can protect young-of-the-year fish overwintering in backwater areas from the cold temperatures of winter floods, which can threaten survival. In the St. Louis District, about 7,350 acres of backwater lakes, backwater sloughs, side channels, and marshes are located behind such levees at the Clarksville, Dresser, Stump, Swan, Calhoun, and Batchtown sites, whose main emphasis is water level management. About 8000 acres of bottomland forest and cropland are also located behind these low levees. Most of these areas lie below the elevation of the levee crown, but some are above it. Other than retarding the rate of sedimentation, the chief effect on the levee- protected terrestrial habitats is the creation of a slightly drier hydrologic regime, due to the prevention of minor flooding. Consequently, fewer small floods in EMP-HREP project areas may promote the natural regeneration of native oaks. In a survey of natural floodplain vegetation of pools 24-26, Klein et al. (1975) observed that pin oak was more often an important component of forested areas protected by agricultural levees than in unprotected forested areas. These agricultural levees generally provide 10 to 25-year protection. An adverse impact of these low levees is that they isolate the floodplain from the river to some degree. These levees prevent the exchange of riverine fish and other aquatic' organisms with backwater areas when river stages are below the levee's crown elevation. Likewise, they prevent the import of nutrients from the river into backwater and terrestrial areas, and the export of organic debris from these areas into the river. However, these processes still occur when bigger floods overtop the levee. To minimize the adverse effect to fish movement, which is most critical during the spring and fall, open topped fish passage/water control structures have been constructed at Stump Lake and Swan Lake and will be constructed at Calhoun Point, and Batchtown to connect fisheries and some waterfowl management units with the river. These four areas envelop 6,770 acres of aquatic habitat. Whether all kinds of fish will use these structures is unknown at the present time, and will be revealed only after field-monitoring studies have been completed. The District has assessed the cumulative impact of low levees at the Swan, Stump, and Calhoun and Batchtown projects, located at the low end of the Alton pool on the Illinois River, on upstream and downstream water surface profiles. A HEC-2 analysis was performed on the Illinois and Mississippi Rivers for conditions with and without the low levees for floods ranging from a 2-year to a 500-year recurrence interval. No significant increases in water surface elevations were projected.

Summary. All EMP-HREP project areas are monitored before and after construction to determine if project goals and objectives are met. Goals and objectives are often stated in terms of anticipated improvements to habitat conditions and water quality, and reductions in rates of sedimentation. Monitoring evidence to date suggests that EMP-HREP projects are achieving their site-specific environmental objectives. The EMP-HREP projects can be characterized as

demonstrations, and are very limited in scope. The program is working only a fraction of the total habitat area of the UMRS. If all planned program activities turn out to be a failure (and there is no evidence to indicate that this will be the case), it would not represent an irreversible, catastrophic impact on the river's ecosystem. The program can be viewed as an ongoing learning experience of large-scale habitat alteration attempts on the river system. As the authority of the program has been extended with no end date in the future, it is planned that the program will learn as it goes, incorporating new thoughts and innovative designs to restore habitats on the river.

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Table 1. Percent composition of land cover types in selected Upper Mississippi and Illinois River reaches in pre-settlement (ca. early 1800s) and contemporary (1989) periods.

Pool	Pre-Settlement					Contemporary						
	Open Water	Marsh	Prairie	Timber	Swamp	Open Water	Marsh	Prairie	Timber	Swamp	Developed	Agriculture
4	49.8	1.5	7.9	40.2	0.2	53	6	5	23	0	5	8
8	21	14.8	8	55.5	0.6	52.8	8.1	9.8	17.7	0	11.1	0.5
13	19.7	4.5	35.1	39.1	1.6	19.6	18.3	5.3	18.6	0	6.6	31.6
17	14.6	0.7	57	25.8	1.9	25.4	1.8	6.6	28.4	0	5.4	32.4
22	13.3	0	35	51.7	0	9.9	0.1	3.6	12.2	0	1.8	72.4
24	13.2	0.1	46.4	40.3	0	10.3	0.7	3.3	13.4	0	0.9	71.4
25,26	18.3	0.4	46.3	35	0	17.9	1.3	5.6	18.6	0	3.1	53.4
OR	6.9	0	0	86.7	6.4	3.6	0	2.4	20.9	0	0.4	68
LaGr	15.3	2.4	20.3	57.5	4.1	17.5	1.9	9.8	22.9	0	2.5	45.4

Table 2. HNA land cover class distribution (in acres) in the UMRS (*=satelite data used).

	1. Open Water	2. Submersed Aquatic Bed	3. Floating-Leaved Aquatic Bed	4. Semi-permanently Flooded Emergent Annual	5. Semi-permanently Flooded Emergent Perennial	6. Seasonally Flooded Emergent Annual	7. Seasonally Flooded Emergent Perennial	8. Wet Meadow	9. Grassland	10. Scrub/Shrub	11. Salix Community	12. Populus Community	13. Wet Floodplain Forest	14. Mesic Bottomland Hardwood Forest	15. Agriculture	16. Developed	17. Sand/Mud	18. No Photo Coverage	Total Acres
Pool 1	847	0	0	0	0	0	0	13	0	57	0	0	341	0	0	2,463	15	0	**3,736**
Pool 2	9,039	734	133	0	320	0	16	1,363	0	525	14	0	5,222	6	558	4,920	301	0	**23,152**
Pool 3	5,557	1,164	189	276	1,232	0	5	1,902	0	1,155	0	0	9,410	0	1,342	1,022	404	0	**23,660**
Pool 4	29,275	4,190	1,486	0	4,177	0	48	1,791	519	791	436	5	11,486	1,122	3,526	3,082	225	0	**62,157**
Pool 5	6,135	2,677	1,549	176	1,537	0	138	1,582	1,467	802	361	1	3,990	1,372	4,860	1,390	129	0	**28,165**
Pool 5a	3,753	1,034	1,317	45	2,098	0	112	348	68	408	320	2	5,400	379	1,450	934	65	0	**17,733**
Pool 6	5,735	1,202	1,848	620	1,544	0	382	553	373	609	181	0	3,055	1,783	293	3,547	18	76	**21,817**
Pool 7	8,966	1,375	1,270	0	3,029	0	0	898	5	323	300	71	3,249	235	1,877	1,842	78	0	**23,519**
Pool 8	13,871	2,304	4,059	0	3,408	0	40	2,885	368	608	572	0	5,443	275	279	3,886	76	0	**38,074**
Pool 9	17,558	2,652	6,319	4	6,110	0	433	2,964	3	510	1,039	155	11,532	16	953	400	66	314	**51,027**
Pool 10	11,320	1,914	2,131	113	3,511	0	564	2,069	40	715	316	58	9,508	263	2,586	3,211	32	606	**38,958**
Pool 11	14,111	2,157	2,675	61	1,342	0	152	885	10	269	144	113	6,136	82	500	562	73	0	**29,273**
Pool 12	8,234	1,435	1,297	8	874	0	219	1,283	27	383	108	9	4,517	230	196	1,598	15	0	**20,431**
Pool 13	15,238	6,183	4,449	0	3,329	0	785	3,149	328	1,009	302	3	11,159	1,756	4,353	7,075	100	0	**59,217**
Pool 14	8,769	877	111	0	573	0	214	913	154	719	167	17	6,664	643	1,951	3,656	18	492	**25,936**
Pool 15	3,250	276	7	0	24	0	5	118	43	155	7	0	284	67	413	4,426	1	148	**9,223**
Pool 16	9,604	1,100	452	0	653	0	122	792	20	732	400	89	5,505	274	2,247	3,178	25	1,629	**26,821**
Pool 17	6,161	479	88	0	212	0	56	691	92	1,116	99	0	6,404	491	9,237	1,747	12	45,478	**72,362**
Pool 18	12,311	890	739	0	840	0	201	2,625	174	3,619	383	67	13,337	5,439	56,915	3,221	193	33,503	**134,457**
Pool 19	24,583	1,952	2,223	0	1,593	0	19	2,550	150	3,296	227	250	13,329	1,830	45,713	7,032	101	14,083	**118,929**
Pool 20	8,119	82	24	0	59	0	7	1,152	0	2,903	40	144	6,645	59	43,819	953	246	11,032	**75,283**
Pool 21	8,149	44	13	0	171	0	43	673	9	2,823	149	228	9,275	227	43,100	1,595	118	0	**66,617**
Pool 22	8,516	79	8	0	97	0	12	886	32	3,064	84	341	9,654	31	42,385	966	66	18,084	**84,305**
Pool 24	11,043	522	287	0	612	0	59	2,045	39	2,924	210	914	11,449	12	26,177	444	48	38,327	**95,111**
Pool 25	14,968	882	157	0	731	0	112	2,668	11	3,372	314	369	16,867	57	43,455	1,093	183	2,292	**87,530**
Pool 26	16,024	761	368	0	803	0	6	1,650	134	1,506	185	459	14,876	1,341	40,169	3,528	230	37,722	**119,762**
L+ D 26 to Kaskaskia R.*	29,585	0	0	0	953	0	0	0	14,965	0	0	0	22,618	0	160,797	47,850	1,820	1	**278,588**
Kaskaskia R. to Grand Tower*	11,441	0	0	0	22	0	0	0	3,211	0	0	0	22,737	0	92,030	538	396	0	**130,374**
Grand Tower to Ohio R.*	25,900	0	0	0	1,613	0	0	0	4,501	0	0	0	36,864	0	186,375	4,377	1,105	4,015	**264,749**
Lockport*	4,045	0	0	0	1	0	0	0	3,054	0	0	0	3,832	0	4	4,491	0	1	**15,429**
Brandon*	331	0	0	0	1	0	0	0	218	0	0	0	237	0	0	1,072	0	0	**1,859**
Dresdon*	2,370	0	0	0	26	0	0	0	1,194	0	0	0	1,725	0	108	627	36	0	**6,086**
Marseilles*	4,623	0	0	0	131	0	0	0	2,101	0	0	0	4,735	0	11,380	2,545	7	4	**25,525**
Starved Rock*	3,092	0	0	0	416	0	0	0	1,046	0	0	0	2,392	0	3,343	3,644	2	0	**13,935**
Peoria*	40,070	0	0	0	5,416	0	0	0	7,292	0	0	0	19,501	0	49,153	9,832	52	0	**131,317**
Lagrange*	34,660	0	0	0	4,806	0	0	0	8,294	0	0	0	38,097	0	131,803	3,511	55	1	**221,227**
Alton*	15,337	0	0	0	2,009	0	0	0	4,516	0	0	0	20,809	0	153,345	1,017	0	1	**197,034**
Total	**452590**	**36965**	**33199**	**1303**	**54273**	**0**	**3750**	**38448**	**54458**	**34393**	**6358**	**3295**	**378284**	**17990**	**1166691**	**147275**	**6311**	**207809**	**2643378**
Percent	**17.1%**	**1.4%**	**1.3%**	**0.0%**	**2.1%**	**0.0%**	**0.1%**	**1.5%**	**2.1%**	**1.3%**	**0.2%**	**0.1%**	**14.3%**	**0.7%**	**44.1%**	**5.6%**	**0.2%**	**7.9%**	**100.0%**

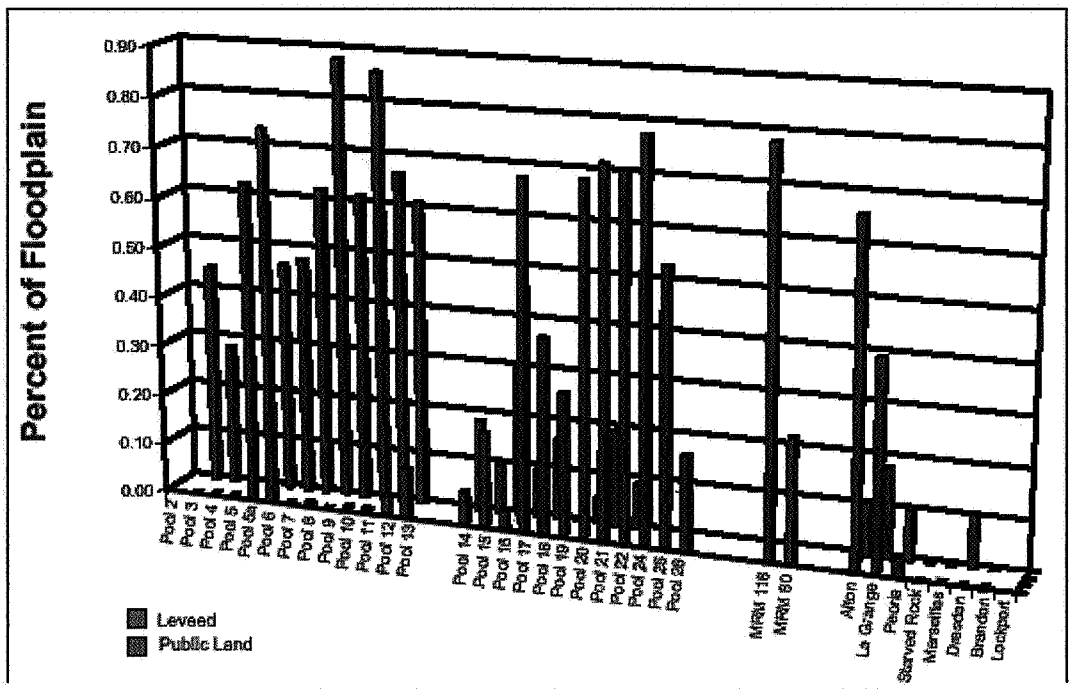


Figure 1. Proportion of Public Lands and Leveed Areas in the UMRS.

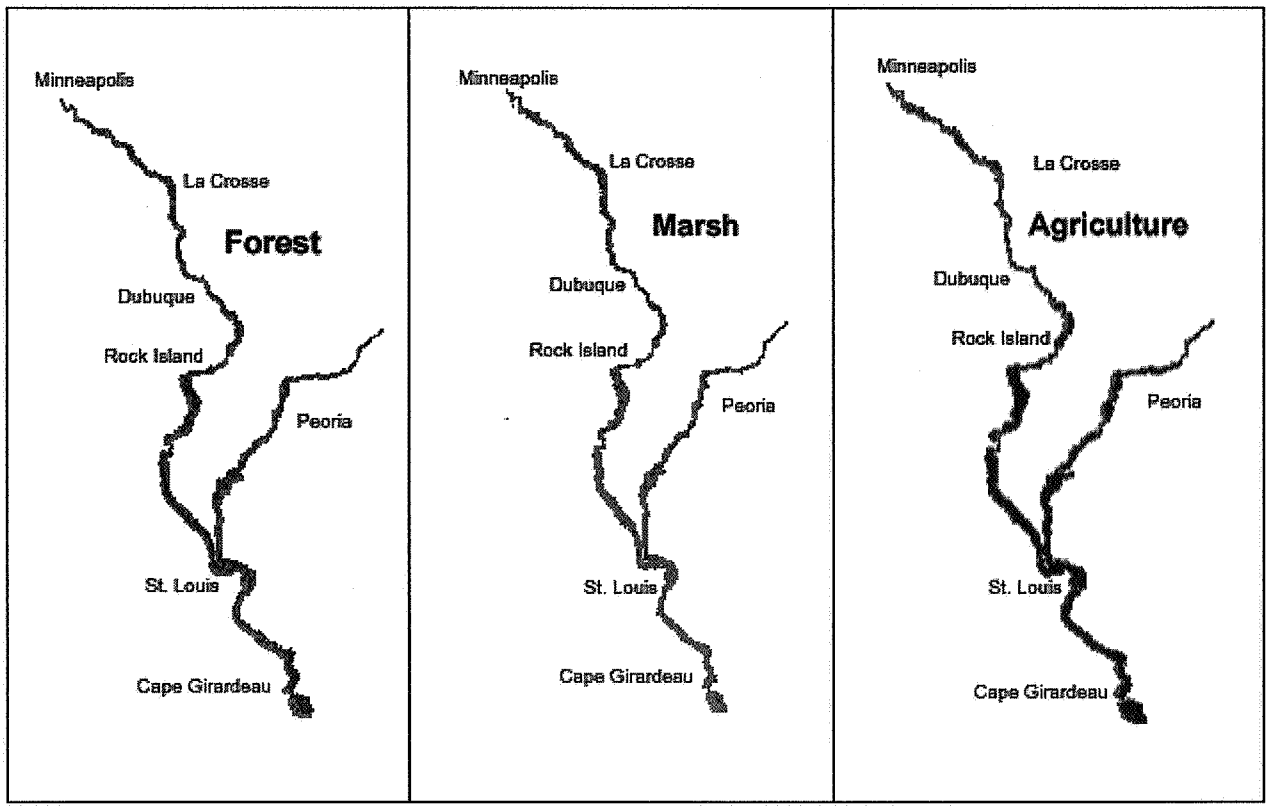


Figure 2. The land cover type is highlighted in red in the image, indicating each land cover's relative distribution throughout the UMRS.

Table 3. Target species, habitat problem, and methods used to address problems for each HREP project in the completed, construction, planning or design phases.

Name	Pool	River	Target Spp.	Habitat Problem	Drg	WLvl	Isl	Sho	SCh	Air	Mast	Trap	Gras	Mus	Pot	Tim	Notc	Dike	Bull	HPts	Rif	Groi	Oak	Wil	Her	Draw	Grad	Brk
Under Construction or Completed																												
Rice Lake	2	MN River	Waterfowl, Wetland Species	Sediment, water quality	x	x		x			x																	
Peterson Lake	4	UMR	UMR Fish	Sedimentation, high current velocities, low temperatures	x			x	x																			
Indian Slough Habitat	4	UMR	UMR Fish	Sediment	x				x												x	x	x					
Spring Lake Peninsula	5	UMR	UMR Fish	Breached, erosion, loss of shallow water, sedimentation, increasing flow	x																							
Small Scale Drawdown	5	UMR	Waterfowl	Lacking seasonal water level fluctuations																						x		
Island 42 Habitat	5	UMR	UMR Fish, Waterfowl	Stagnation, oxygen depletion	x				x	x			x											x				
Finger Lakes Habitat	5	UMR	UMR Fish	Low oxygen						x																		
Polander Lake	5a	UMR	Waterfowl, UMR Fish	Emergent to submergent vegetation, sedimentation, wave action, water velocities, turbidity, structural diversity			x	x	x																			
Trempealeau	6	UMR	Waterfowl, UMR Fish	Turbid, limited aquatic plant growth, Wave action, rough fish, low oxygen	x	x		x																				
Lake Onalaska Habitat	7	UMR	UMR Fish	oxygen problems, Islands erosion, turbidity	x		x	x		x																		
Long Lake Habitat Rehabilitation	7	UMR	UMR Fish	Lack of oxygen	x																							
Mississippi River Bank Stabilization Habitat (EMP)	5-10	UMR	UMR Fish	Erosion, increases in flow or sedimentation, shallowing of aquatic habitat	x			x																				
Pool 8 - Phase I	8	UMR	UMR Fish, Waterfowl	Island erosion, fetch, turbidity, loss of aquatic plant beds	x		x	x	x				x											x				
Pool 8 - Phase II	8	UMR	UMR Fish, Waterfowl		x		x	x																				
East Channel Habitat	8	UMR	UMR Fish	Erosion , loss of island habitat				x																				
Pool 9	9	UMR	Waterfowl, UMR Fish	Island erosion, sediment, Wave action, sediment resuspention, turbidity			x		x																			
Blackhawk Park Backwater Restoration	9	UMR	UMR Fish	Oxygen depletion					x	x																		
Lansing Big Lake	9	UMR	UMR Fish, Waterfowl	Sediments, turbidity					x																			
Cold Springs	9	UMR	UMR Fish	Low oxygen, Sedimentation, fish escapement	x					x																		
Bussey Lake	10	UMR	UMR Fish	Sedimentation, eutrophication	x	x	x																					
Guttenberg Waterfowl Ponds	11	UMR	Waterfowl, UMR Fish	Inadequate water supply and drainage		x																						
Bertom McCartney Lakes	11	UMR	UMR Fish	Sedimentation, Low winter oxygen, Sediment resuspension	x		x	x	x					x														
Potters Marsh	13	UMR	Waterfowl, UMR Fish, Migratory Birds.	Siltation, Overabundance of submergent veg	x								x		x													
Spring Lake	13	UMR	UMR Fish, Waterfowl.	Breaching of the Lower Lake dike, sedimentation, Inadequate water level control, woody and undesireable perenial encroachment		x		x		x																		
Brown's Lake	13	UMR	Waterfowl, Fish, Furbearer		x	x				x	x																	
Princeton Refuge	14	UMR	Waterfowl, Furbearers, Wetland Species, UMR Fish.	Woody veg encroacment, Siltation, levee breaching, loss of management capability		x					x																	
Andalusia	16	UMR	Waterfowl, UMR Fish.	Lack of shallow water habitat, lack of off-channel, deep aquatic	x	x	x			x																		
Big Timber	17	UMR	Waterfowl, UMR Fisheries.	Sedimentation, low oxygen , Lack of deepwater, Conversion of aquatic habitat	x						x				x													
Monkey Chute	21	UMR	UMR Fish	Sedimentation, conversion of aquatic to terrestrial habitats	x																							
Cottonwood Island	21	UMR	UMR Fish, Waterfowl.	Sedimentation, Low oxygen, fish species diversity has decreased							x				x	x	x											
Gardner Division	21	UMR	Migratory Birds, UMR Fish	Siltation, vegetation encroachment	x			x			x							x										
Bay Island	22	UMR	Waterfowl, Migratory Birds, Furbearers.	Sedimentation converting wetlands to terrestrial habitats		x					x																	
Clarksville Refuge	24	UMR	Waterfowl	Sedimentation converting wetlands to terrestrial habitats		x																						
Pharrs Island	24	UMR	UMR Fish	Wetland to terrestrial, lack of deep water fish habitat															x									
Batchtown	25	UMR	Waterfowl, UMR Fish	Sedimentation, loss of vegetation, lack of deep water fish habitat		x						x																
Stag Island	25	UMR	UMR Fish	Sedimentation														x										
Dresser Island	26	UMR	Waterfowl, UMR Fish	Sedimentation, limited water control, water quality	x	x																						

Name	Pool	River	Target Spp.	Habitat Problem	Drg	WLvl	Isl	Sho	SCh	Air	Mast	Trap	Gras	Mus	Pot	Tim	Notc	Dike	Bull	HPts	Rif	Groi	Oak	Wil	Her	Draw	Grad	Brk
Cuivre Island	26	UMR	Waterfowl	Sedimentation, lack of deep water, limited water control		x			x		x									x								x
Calhoun Point	26/Alt	UMR/IWW	Waterfowl, UMR Fish	Sedimentation, loss of vegetation, lack of deep water fish habitat	x	x																						
Lake Chautauqua	LaGr	IWW	Waterfowl, UMR Fish.	Sediments, depths, water quality, soft lake bottoms		x																						
Banner Marsh	LaGr	IWW	Waterfowl, UMR Fish, Furbearers	Leveed agriculture, active mining		x							x														x	
Peoria Lake	Peo	IWW	UMRS Fish and Waterfowl	Sedimentation, resuspension of sediments, soft lake bottom		x	x		x																x			
Swan Lake	Alt	IWW	Waterfowl, UMR Fish	Sediment, lack of deep water habitat	x	x	x		x																	x		
Stump Lake	Alt	IWW	Waterfowl, UMR Fish	Sediment, lack of deep water habitat, reduced ability to manage moist soil	x	x					x																	
Planning/Design																												
Long Meadow Lake	2	MN River	Waterfowl, Wetland Species	Sediment, water quality		x					x																	
Spring Lake Islands	5	UMR	Waterfowl, UMR Fish	Island erosion, turbidity, loss of aquatic plant	x		x																					
Pool 8 - Phase III	8	UMR	UMR Fish, Waterfowl		x		x	x																				
Harpers Slough Habitats	9	UMR	Waterfowl UMR Fish, Wetland Species	Island erosion and depletion	x			x																				
Lake Winneshiek Habitat	9	UMR	UMR Fish, Waterfowl	Islands, turbidity, vegetated	x		x																					
Capoli Slough	9	UMR																										
Pool Slough	9	UMR	Waterfowl	Sedimentation, reduction of aquatic plant		x																						
Conway Lake Habitat	9	UMR	UMR Fish	Oxygen, Erosion, excessive flow, sedimentation	x																							
Ambrough Slough Habitat	10	UMR	UMR Fish	Siltation, low oxygen	x																							
Pool 11 Islands	11	UMR	Waterfowl, UMR Fish.	Decrease in island, erosion	x		x	x																				
Pleasant Creek	13	UMR	Waterfowl, Migratory Birds	Increased turbidity and sedimentation		x					x																	
Smith Creek	13	UMR	UMR Fish, Furbearer, Waterfowl, Wetland Species.	Sedimentation				x				x																
Lake Odessa	17-18	UMR	Waterfowl, UMR Fish	Limited water level management, Levee breaches, losses of emergent aquatic vegetation, Sedimentation, winterkills	x	x																						
Pool 25-26 Islands	25/26	UMR																										
Jefferson Barracks	28 (OR)	UMR	UMR Fish, Migratory Birds	Sedimentation, bank erosion, lack of connectivity																								
Stone Dike Alterations	28/29 (OR)	UMR																										
Schenimann Chute	29 (OR)	UMR	UMR Fish	Sedimentation, low oxygen, connectivity	x				x								x			x								
Establishment Chute	29 (OR)	UMR																										
Fort Charters	29 (OR)	UMR																										
Rice Lake	LaGr	IWW	Waterfowl, Migratory Birds	Sedimentation																								

Key to Methods Used

Drg	Backwater Dredging	Notc	Dike notch
WLvl	Water Level Management (Dikesand Water Control Systems)	Dike	Emergent Dike
Isl	Islands	Bull	Bullnose
Sho	Shoreline Stabilization	HPts	Hardpoints
SCh	Secondary Channel Modification	Rif	Rock riffle
Air	Aeriation	Groi	Tree groins
Mast	Mast trees	Oak	Oak Savana
Trap	Upland Sediment Traps	Wil	Willow Plantings
Gras	Natural Grasses	Her	Herbaceous vegetation
Mus	Mussel bed	Draw	Drawdown
Pot	Potholes	Grad	Littoral zone grading
Tim	Timbersale	Brk	Breakwater

Table 4. UMRS HREP Site Reference Table.

Name	Map	Project Acres	Name	Map	Project Acres
Rice Lake	1	170	Andalusia	40	393
Long Meadow Lake	2	1000	Big Timber	41	1198
Goose Lake [1]	3	3000	Lake Odessa	42	6395
Peterson Lake	4	512	Huron Island [1]	43	30
Indian Slough Habitat	5	248	Gardner Division	44	7344
Finger Lakes Habitat	6	146	Cottonwood Island	45	572
Island 42 Habitat	7	228	Monkey Chute	46	295
Whitewater River [1]	8	2000	Bay Island	47	745
Spring Lake Peninsula [2]	9		Peoria Lake	48	3120
Spring Lake Islands	10	402	Banner Marsh	49	4085
Polander Lake	11	1211	Rice Lake	50	1500
Small Scale Drawdown	12	52	Lake Chautauqua	51	4589
Trempealeau	13	1571	Lake Chautauqua Lower Lake Dewatering	51	--
Long Lake Habitat Rehabilitation	14	15	Clarksville Refuge	52	312
Lake Onalaska Habitat	15	1502	Alton Pool [4]	53	
East Channel Habitat	16	92	Pharrs Island	54	671
Pool 8 - Phase I	17	964	Angle Blackburn Islands	55	516
Pool 8 - Phase II	18	594	Norton Woods	56	346
Pool Slough	19	249	Stag Island	57	469
Blackhawk Park Backwater Restoration	20	405	Sandy Chute	58	695
Lansing Big Lake	21	3467	Batchtown	59	3424
Conway Lake Habitat	22	560	Pool 25-26 Islands	60	1500
Capoli Slough	23	535	Cuivre Island	61	2179
Pool 9	24	332	Dresser Island	62	1027
Cold Springs	25	35	Stump Lake	63	2958
Harpers Slough Habitats	26	2187	Swan Lake	64	4922
Ambrough Slough Habitat	27	2843	Calhoun Point	65	2138
Bussey Lake	28	242	Osborne Sidechannel [1]	66	150
Guttenberg Waterfowl Ponds	29	73	Least Tern [1]	67	
UMR Bank Stabilization Habitat (EMP)	30	1500	Stone Dike Alterations [3]	68	
Bertom McCartney Lakes	31	2362	Schenimann Chute	69	300
Pool 11 Islands	32	9897	Smith Creek	70	50
Peosta Channel	33	50	Pool 8 - Phase III [4]	71	
(Molo Slough) Pool 12 Overwintering	34	7986	Lake Winneshiek Habitat	72	1200
Pleasant Creek	35	2669	Jefferson Barracks	73	150
Brown's Lake	36	1332	Establishment Chute	74	150
Spring Lake	37	3319	Fort Charters	75	150
Potters Marsh	38	2998	Red's Landing [1]	76	2000
Princeton Refuge	39	1144	Turner Island [1]	77	150

1-Acreage is rough estimate 2- Project is linear and acres not determined 3- Project will be phased/no acreage determined 4- No acreage determined

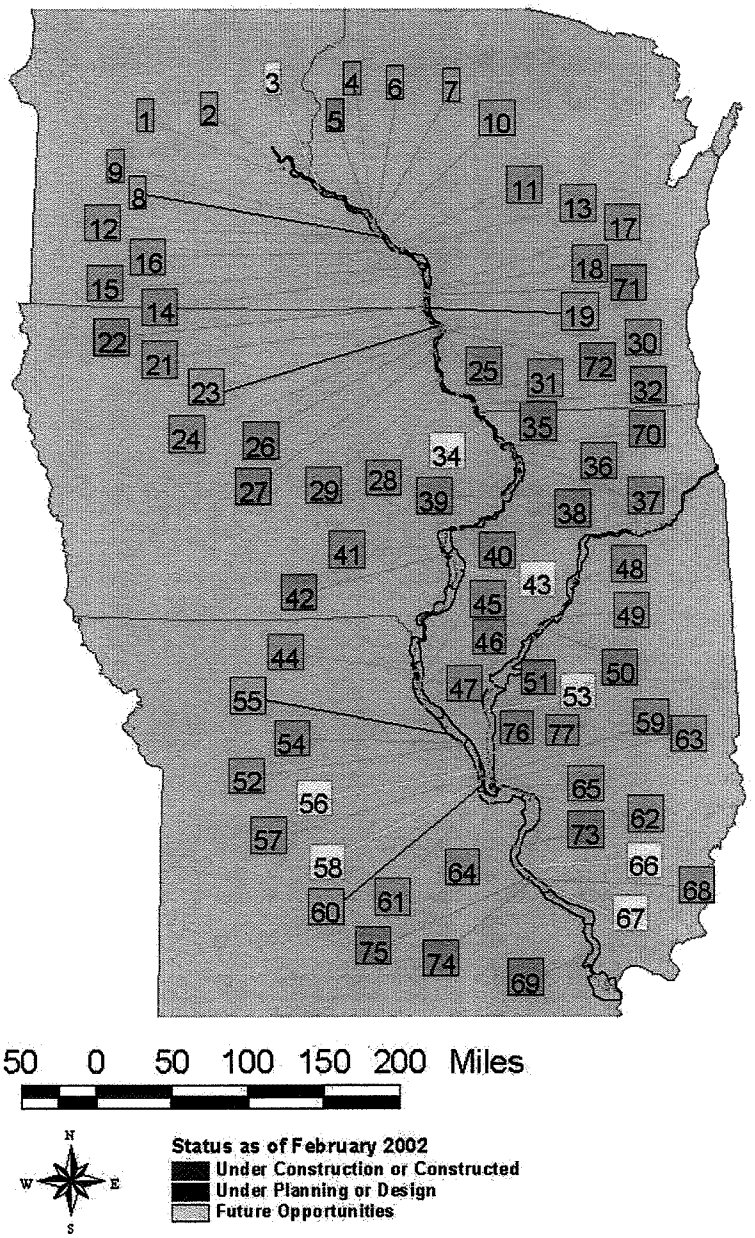


Figure 3. UMRS HREP Site Map.

Table5. Breakdown of Projects by Phase and by District.

District	Stage	Number	Average Size (Acres)	Total Size (Acres)
St. Paul	Comp/Const	21	668	13361
St. Paul	Des/Plan	9	1122	8976
St. Paul	Future	2	2500	5000
		SP Tot. =32	**1430 SP Ave**	**SP Tot. =27337**
Rock Island	Comp/Const	14	2392	33495
Rock Island	Des/Plan	5	4102	20511
Rock Island	Future	3	2729	8186
		RI Tot. =22	**3074 RI Ave**	**RI Tot. =62191**
St. Louis	Comp/Const	9	2003	18027
St. Louis	Des/Plan	6	450	2250
St. Louis	Future	8	643	3856
		SL Tot. =23	**1032 SL Ave**	**SL Tot. =24133**
		Overall Tot. =77	***1579 Overall Ave***	***Overall Tot.= 113661***

Table 6. Percentage of land cover types within boundaries of HREP projects.

HREP	1. Open Water	2. Submersed Aquatic Bed	3. Floating-Leaved Aquatic Bed	4. Semi-permanently Flooded Emergent Annual	5. Semi-permanently Flooded Emergent Perennial	6. Seasonally Flooded Emergent Annual	7. Seasonally Flooded Emergent Perennial	8. Wet Meadow	9. Grassland	10. Scrub/Shrub	11. Salix Community	12. Populus Community	13. Wet Floodplain Forest	14. Mesic Bottomland Hardwood Forest	15. Agriculture	16. Developed	17. Sand/Mud	18. No Photo Coverage
Indian Slough	20.9%	39.2%	6.9%	0.0%	19.2%	0.0%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	8.7%	0.0%	0.0%	0.0%	2.7%	0.0%
Peterson Lake	59.4%	30.8%	0.4%	0.0%	1.3%	0.0%	0.0%	0.4%	0.1%	2.7%	0.1%	0.0%	3.0%	0.2%	0.0%	1.8%	0.0%	0.0%
Finger Lakes	25.1%	22.9%	7.9%	0.0%	4.2%	0.0%	0.3%	3.1%	0.0%	0.0%	0.0%	0.0%	35.5%	0.1%	0.0%	1.0%	0.0%	0.0%
Island 42	2.2%	24.1%	20.1%	0.0%	2.9%	0.0%	2.6%	6.6%	0.0%	1.3%	0.0%	0.0%	38.5%	0.0%	0.0%	0.0%	1.8%	0.0%
Spring Lake Islands	10.7%	60.8%	24.2%	0.0%	0.6%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	2.8%	0.0%	0.0%	0.6%	0.0%	0.0%
Polander Lake	67.6%	8.8%	12.9%	0.0%	5.9%	0.0%	0.5%	0.1%	0.0%	0.2%	0.4%	0.0%	2.6%	0.3%	0.0%	0.2%	0.4%	0.0%
Trempeleau	44.1%	2.5%	9.1%	11.8%	8.8%	0.0%	1.8%	9.2%	0.0%	1.3%	0.4%	0.0%	10.0%	1.0%	0.0%	0.0%	0.0%	0.0%
Lake Onalaska	64.3%	11.1%	10.7%	0.0%	3.4%	0.0%	0.0%	0.8%	0.3%	0.2%	0.0%	0.1%	6.9%	0.1%	0.0%	1.3%	0.9%	0.0%
Pool 8 Islands Phase 1	54.5%	0.7%	0.1%	0.0%	1.3%	0.3%	0.0%	1.5%	0.0%	0.0%	7.4%	29.8%	0.0%	3.4%	0.0%	0.0%	1.0%	0.0%
Pool 8 Islands Phase 2	25.2%	1.2%	0.4%	0.0%	0.3%	0.0%	0.0%	0.0%	1.3%	0.0%	16.5%	46.8%	0.0%	6.0%	0.0%	0.0%	2.3%	0.0%
Blackhawk Park	21.2%	12.6%	26.8%	0.0%	9.1%	0.0%	2.5%	6.1%	0.0%	0.5%	0.2%	0.0%	20.6%	0.0%	0.0%	0.3%	0.0%	0.0%
Capoli Slough	17.2%	16.5%	37.2%	0.0%	24.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.9%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Harpers Slough	46.5%	9.6%	37.9%	0.0%	3.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%
Lansing Big Lake	20.2%	2.5%	29.6%	0.0%	18.5%	0.0%	1.2%	4.7%	0.0%	1.2%	2.2%	0.0%	19.9%	0.0%	0.0%	0.0%	0.0%	0.0%
Pool 9 Island	48.4%	36.7%	13.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pool Slough	0.8%	1.2%	0.0%	0.0%	6.7%	0.0%	0.0%	61.0%	1.0%	2.9%	5.1%	0.0%	5.5%	0.0%	14.9%	0.8%	0.0%	0.0%
Ambrough Slough	12.6%	5.3%	12.5%	0.0%	18.7%	0.0%	2.7%	9.4%	0.0%	1.7%	0.5%	0.1%	35.0%	0.0%	0.2%	1.4%	0.0%	0.0%
St. Paul	**31.8%**	**16.8%**	**14.7%**	**0.7%**	**7.7%**	**0.0%**	**0.7%**	**6.3%**	**0.2%**	**0.7%**	**2.0%**	**4.5%**	**11.4%**	**0.7%**	**0.9%**	**0.4%**	**0.5%**	**0.0%**
Bertom and McCartney Lakes	14.8%	3.0%	30.9%	2.3%	8.2%	0.0%	1.9%	4.3%	0.0%	0.2%	0.6%	0.7%	33.0%	0.0%	0.1%	0.0%	0.0%	0.0%
Guttenberg Waterfowl Ponds	1.1%	41.0%	25.3%	0.0%	12.2%	0.0%	0.0%	2.0%	0.0%	2.9%	1.0%	0.0%	11.1%	0.0%	0.0%	3.3%	0.0%	0.0%
Pool 11 Islands	68.3%	14.0%	7.9%	0.0%	3.8%	0.0%	0.1%	0.9%	0.0%	0.5%	0.4%	0.0%	3.1%	0.0%	0.1%	0.8%	0.0%	0.0%
Peosta Channel	79.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	8.3%	0.0%	0.0%	3.4%	0.0%	0.0%	7.3%	0.0%	0.0%
Pool 12 Islands	43.6%	6.8%	3.7%	0.1%	4.0%	0.0%	1.3%	8.3%	0.0%	0.5%	0.6%	0.1%	30.3%	0.0%	0.2%	0.5%	0.1%	0.0%
Brown's Lake	6.9%	13.4%	11.6%	0.0%	17.7%	0.0%	1.4%	4.5%	0.0%	2.0%	1.8%	0.0%	36.7%	0.0%	0.6%	0.3%	2.8%	0.0%
Pleasant Creek	4.8%	2.3%	6.9%	0.0%	6.5%	0.0%	5.3%	7.7%	0.7%	2.9%	0.2%	0.0%	58.6%	1.4%	2.4%	0.1%	0.0%	0.0%
Potters Marsh	15.3%	14.8%	22.9%	0.0%	9.1%	0.0%	0.1%	2.4%	1.8%	8.2%	0.2%	0.0%	13.0%	6.2%	3.6%	2.5%	0.0%	0.0%
Spring Lake	4.8%	11.4%	57.1%	0.0%	10.1%	0.0%	0.6%	6.0%	0.3%	1.0%	0.6%	0.0%	7.7%	0.0%	0.2%	0.1%	0.0%	0.0%
Princeton Refuge	0.1%	2.9%	0.0%	0.0%	18.3%	0.0%	2.4%	10.0%	0.0%	5.4%	6.1%	0.0%	34.9%	0.2%	19.0%	0.5%	0.0%	0.0%
Andalusia Refuge	3.9%	11.6%	10.0%	0.0%	13.4%	0.0%	2.0%	13.5%	0.0%	0.2%	3.9%	3.6%	37.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Big Timber	13.1%	5.2%	2.7%	0.0%	4.7%	0.0%	0.8%	1.3%	0.0%	1.1%	1.8%	0.0%	69.2%	0.0%	0.0%	0.1%	0.0%	0.0%
Lake Odessa	20.8%	0.4%	3.3%	0.0%	4.3%	0.0%	0.4%	10.2%	0.0%	6.2%	2.9%	0.0%	43.3%	0.1%	7.3%	0.1%	0.5%	0.0%
Cottonwood Chute	13.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	13.7%	0.0%	5.5%	60.1%	0.0%	7.1%	0.0%	0.0%	0.0%
Gardner Division	23.7%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.8%	0.0%	1.9%	1.2%	1.3%	56.8%	0.0%	12.7%	0.3%	0.8%	0.0%
Monkey Chute	25.8%	0.0%	0.0%	0.0%	0.8%	0.0%	0.4%	0.9%	0.0%	4.1%	0.0%	0.0%	67.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Bay Islands	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	6.3%	0.0%	2.1%	68.0%	0.0%	18.9%	0.0%	0.0%	0.0%
Peoria Lake	82.6%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	15.1%	0.0%	0.8%	0.0%	0.0%	0.0%
Banner Marsh	12.2%	0.0%	0.0%	0.0%	2.0%	0.0%	0.0%	0.0%	74.2%	0.0%	0.0%	0.0%	8.5%	0.0%	3.2%	0.0%	0.0%	0.0%
Lake Chataqua	84.5%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.9%	0.0%	0.0%	0.0%	0.0%	0.0%
Rock Island	**26.2%**	**6.3%**	**9.1%**	**0.1%**	**6.0%**	**0.0%**	**0.8%**	**3.7%**	**3.9%**	**3.3%**	**1.1%**	**0.7%**	**33.5%**	**0.4%**	**3.8%**	**0.8%**	**0.2%**	**0.0%**
Angle Blackburn Island	6.3%	0.3%	0.0%	0.0%	0.7%	0.0%	0.0%	4.9%	0.0%	1.2%	4.8%	35.0%	46.9%	0.0%	0.0%	0.0%	0.0%	0.0%
Clarksville Refuge	5.8%	0.0%	11.6%	0.0%	18.3%	0.0%	0.0%	17.4%	0.0%	3.8%	0.0%	5.8%	35.6%	0.0%	0.0%	1.6%	0.0%	0.0%
Pharrs Island	42.1%	4.7%	10.3%	0.0%	3.6%	0.0%	0.2%	1.2%	0.0%	0.4%	0.7%	1.0%	35.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Batchtown	24.0%	19.7%	3.7%	0.0%	7.8%	0.0%	0.8%	0.5%	0.0%	4.5%	0.8%	4.6%	25.6%	0.0%	7.6%	0.1%	0.2%	0.0%
Norton Woods	15.4%	1.3%	0.0%	0.0%	2.5%	0.0%	0.0%	0.6%	0.0%	3.7%	0.0%	4.4%	70.0%	0.0%	0.0%	1.9%	0.0%	0.0%
Sandy Chute	17.5%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	15.1%	0.0%	9.4%	0.1%	0.0%	53.9%	0.1%	0.0%	1.7%	1.9%	0.0%
Stag Island	15.4%	1.3%	0.0%	0.0%	2.5%	0.0%	0.0%	0.6%	0.0%	3.7%	0.0%	4.4%	70.0%	0.0%	0.0%	1.9%	0.0%	0.0%
Calhoun Point	8.4%	1.6%	0.7%	0.0%	7.4%	0.0%	0.0%	2.3%	0.1%	0.8%	0.1%	0.8%	62.7%	2.7%	11.2%	1.2%	0.0%	0.0%
Cuivre Island	18.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	0.0%	0.4%	1.1%	1.1%	64.5%	0.0%	8.9%	0.6%	1.3%	0.0%
Dresser Island	13.2%	15.1%	6.3%	0.0%	4.9%	0.0%	0.0%	1.8%	0.0%	0.1%	0.2%	0.0%	58.4%	0.0%	0.0%	0.0%	0.0%	0.0%
Stump Lake	16.1%	0.0%	0.0%	0.0%	11.7%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	54.4%	0.0%	17.1%	0.0%	0.0%	0.0%
Swan Lake	48.5%	0.0%	0.0%	0.0%	6.5%	0.0%	0.0%	0.0%	2.6%	0.0%	0.0%	0.0%	30.1%	0.0%	12.2%	0.0%	0.0%	0.0%
St. Louis	**19.2%**	**3.7%**	**2.7%**	**0.0%**	**5.5%**	**0.0%**	**0.1%**	**4.1%**	**0.3%**	**2.3%**	**0.6%**	**4.8%**	**50.7%**	**0.2%**	**4.7%**	**0.7%**	**0.3%**	**0.0%**

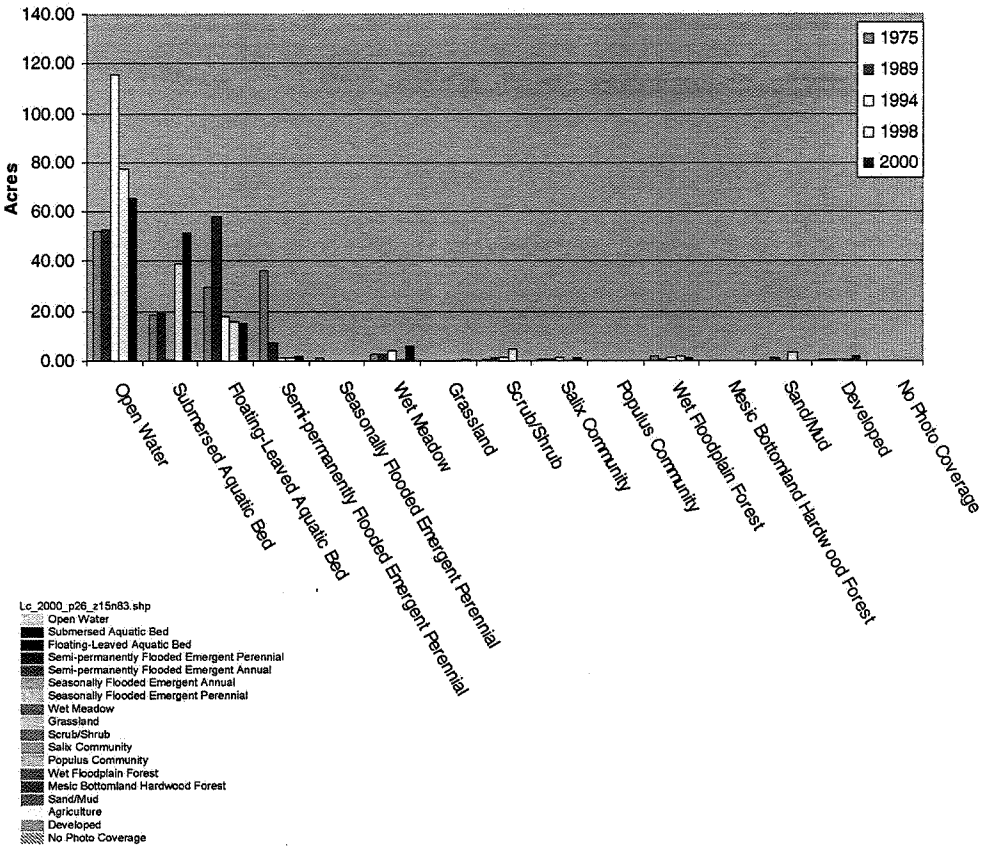
Table 7. Acres of land cover types within boundaries of HREP projects.

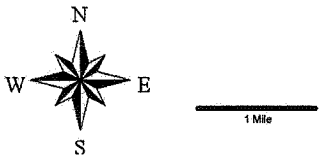
HREP	1. Open Water	2. Submersed Aquatic Bed	3. Floating-Leaved Aquatic Bed	4. Semi-permanently Flooded Emergent Annual	5. Semi-permanently Flooded Emergent Perennial	6. Seasonally Flooded Emergent Annual	7. Seasonally Flooded Emergent Perennial	8. Wet Meadow	9. Grassland	10. Scrub/Shrub	11. Salix Community	12. Populus Community	13. Wet Floodplain Forest	14. Mesic Bottomland Hardwood Forest	15. Agriculture	16. Developed	17. Sand/Mud	18. No Photo Coverage
Indian Slough	52	97.5	17.2	0	47.7	0	0	5.8	0	0	0	0	21.6	0	0	0	6.8	0
Peterson Lake	304.2	157.7	2.2	0	6.5	0	0.1	1.8	0.3	13.6	0.3	0	15.2	1	0	9.2	0	0
Finger Lakes	36.6	33.4	11.5	0	6.1	0	0.4	4.6	0	0	0	0	51.8	0.2	0	1.5	0	0
Island 42	5	55.1	46	0	6.6	0	5.9	15	0	3	0	0	88	0	0	0	4.2	0
Spring Lake Islands	43.1	244.1	97.3	0	2.4	0	0	0.3	0	0.4	0	0	11.4	0	0	2.6	0	0
Polander Lake	818.2	106.3	156.3	0	72	0	6	1.2	0	2.7	4.9	0	31.6	3.9	0	2.5	5.2	0
Trempeleau	692.8	38.5	143	185.8	137.6	0	27.6	144.2	0.2	20.1	6.3	0	157.5	15.9	0	0	0	0
Lake Onalaska	1024.8	176.4	169.8	0	53.4	0	0	13.3	4.7	2.7	0	1.6	110.1	2	0	20.8	14.4	0
Pool 8 Islands Phase 1	324.1	4.3	0.3	0	7.7	1.7	0	8.8	0	0	44	177.3	0	20.3	0	0	6	0
Pool 8 Islands Phase 2	242.3	11.2	4.3	0	2.6	0	0	0.2	12.5	0	159.4	451.2	0	57.4	0	0.4	21.8	0
Blackhawk Park	86	51.1	108.9	0	36.8	0	10	24.6	0	2.2	1	0	83.6	0	0	1.4	0	0
Capoli Slough	92.1	88	199	0	128.3	0	0	11.2	0	0	4.8	0	11.3	0	0	0	0	0
Harpers Slough	1017.5	210.3	829.3	0	79	0	0	0	0	0.9	0	0	50.6	0	0	0	0	0
Lansing Big Lake	701.2	85	1027	0	641.7	0	40.2	163.8	0	41.4	76.3	0.7	689.4	0	0	0	0	0
Pool 9 Island	160.8	122.1	43.3	0	6.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Pool Slough	2.1	3	0	0	16.6	0	0	151.9	2.4	7.3	12.6	0	13.8	0	37.2	2.1	0	0
Ambrough Slough	357.4	151.8	355.6	0	533	0	75.4	267.7	0	48.2	13.3	1.9	994.6	0	5.1	39	0	0
St. Paul	**5960.2**	**1635.8**	**3211**	**185.8**	**1784.1**	**1.7**	**165.6**	**814.4**	**20.1**	**142.5**	**322.9**	**632.7**	**2330.5**	**100.7**	**42.3**	**79.5**	**58.4**	**0**
Bertom and McCartney Lakes	349.5	70.3	729.8	54.6	193.1	0	44.4	101.3	0	4.1	15	15.8	779.8	0	1.4	0.8	0	0
Guttenberg Waterfowl Ponds	3.5	129.3	79.8	0	38.6	0	0.1	6.4	0	9.2	3.1	0	35	0	0	10.5	0	0
Pool 11 Islands	6757.5	1388.2	779.4	4.1	380.1	0	9.6	90	0	46.4	42.6	0	307.1	4.2	12.9	74.3	0	0
Peosta Channel	135.5	0	0	0	0	0	0	2.2	0	14.1	0	0	5.7	0	0	12.4	0	0
Pool 12 Islands	3483.6	544.6	292.8	7.5	323.2	0	104.8	659.4	0	37	47.7	6.6	2416.6	3	13.5	37	6.8	0
Brown's Lake	92.5	178.5	155	0	235.7	0	19.3	59.6	0	27.3	24.5	0	489.4	0	8.5	4.3	37.5	0
Pleasant Creek	126.9	62.1	185.4	0	173.6	0	141.8	206.4	19.2	78	5.9	0	1565	36.1	65.2	2.8	0	0
Potters Marsh	458	442.1	687.6	0	273.4	0	2.2	72.2	53.6	245.4	5.2	0	388.9	185.4	107.5	74.2	1.4	0
Spring Lake	160.4	377.9	1896	0	335.8	0	18.7	198.9	11.2	33.9	18.8	0	256.9	0.2	7.3	2.5	0.3	0
Princeton Refuge	1.2	32.8	0.2	0	208.5	0	27.7	114	0	61.8	69.7	0	397.1	2.1	216.1	5.4	0	0
Andalusia Refuge	14.8	43.7	37.9	0	50.5	0	7.7	51	0	0.8	14.6	13.5	142.8	0	0	0	0	0
Big Timber	156.9	62.4	32.4	0	56.3	0	10.1	15	0	13.5	21.4	0	829	0	0	0.9	0	0
Lake Odessa	1328.5	25.4	213.9	0	275.7	0	28.2	651	2.8	397.6	184.8	0	2769.7	9.1	465.8	7	34.8	0
Cottonwood Chute	76.8	0	0	0	0	0	0	0.9	0	78.2	0	31.7	343.8	0	40.5	0	0	0
Gardner Division	1739.2	0	0.8	0	40	0	0	61.9	0	137.1	86.2	94	4173.4	0	933.6	21.4	56.3	0
Monkey Chute	76.1	0	0	0	2.5	0	1.3	2.7	0	12.2	0	0	200	0	0	0	0	0
Bay Islands	31.7	0	0	0	0	0	0	3.2	0	47.2	0	15.6	506.5	0	140.5	0	0	0
Peoria Lake	2575.8	0	0	0	36.3	0	0	0	11.2	0	0	0	469.7	0	24.5	1.2	0	0
Banner Marsh	496.8	0	0	0	79.7	0	0	0	3025.9	0	0	0	345.9	0	129.5	0	0	0
Lake Chataqua	3826.6	0	0	0	163.8	0	0	0	0	0	0	0	538.5	0	0	0	0	0
Rock Island	**21891.8**	**3357.3**	**5091**	**66.2**	**2866.8**	**0**	**415.9**	**2296.1**	**3123.9**	**1243.8**	**539.5**	**177.2**	**16960.8**	**240.1**	**2166.8**	**254.7**	**137.1**	**0**
Angle Blackburn Island	32.6	1.3	0	0	3.5	0	0	25.4	0	6.1	24.6	180.7	241.9	0	0	0	0	0
Clarksville Refuge	18.2	0	36.2	0	57.2	0	0	54.3	0	11.8	0	18.2	110.9	0	0	5.1	0	0
Pharrs Island	281.9	31.4	69	0	23.9	0	1.4	8.3	0	2.6	4.7	6.8	240.1	0	0	0	0	0
Batchtown	821.2	673.1	127.8	0	267	0	28.4	18.8	0	154.7	27.7	157.4	875.3	0	259.6	3.3	7.8	0
Norton Woods	53.3	4.6	0	0	8.7	0	0	2.2	0	12.9	0	15.2	242	0	0	6.6	0	0
Sandy Chute	121.3	0	0	0	1.4	0	0	105	0	65.3	0.9	0	374.4	1	0	11.7	13.3	0
Stag Island	53.3	4.6	0	0	8.7	0	0	2.2	0	12.9	0	15.2	242	0	0	6.6	0	0
Calhoun Point	178.9	35.2	15.8	0	157.9	0	0	48.5	2.4	17.8	1.6	17.2	1340.5	57.1	239.7	25	0.8	0
Cuivre Island	391.5	0	0	0	0	0	0	91.6	0	8.9	24.6	23	1403.5	0.5	192.9	12.6	28.4	0
Dresser Island	135.5	155.4	64.2	0	49.8	0	0	18.8	0	0.9	1.8	0	599.9	0	0	0.1	0	0
Stump Lake	505.9	0	0	0	367.2	0	0	0	22.4	0	0	0	1710.6	0	536.8	0	0	0
Swan Lake	2386	0	0	0	318.9	0	0	0	129.6	0	0	0	1482.7	0	601.6	0	0	0
St. Louis	**4979.6**	**905.6**	**313**	**0**	**1264.2**	**0**	**29.8**	**375.1**	**154.4**	**293.9**	**85.9**	**433.7**	**8863.8**	**58.6**	**1830.6**	**71**	**50.3**	**0**
Total Sum of Acres	***32831.6***	***6086.6***	***9238.9***	***252***	***5982.5***	***0***	***611.7***	***3504.4***	***3285.9***	***1695.7***	***749.5***	***615.1***	***28165.4***	***323.4***	***4039.7***	***413.8***	***230.5***	***0***

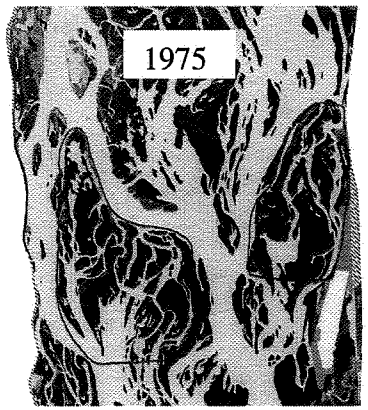
Figure 4. Pool 8 Island HREP Phase 1 and 2 Land Cover Change, 1975-1989-1994-1998-2000.

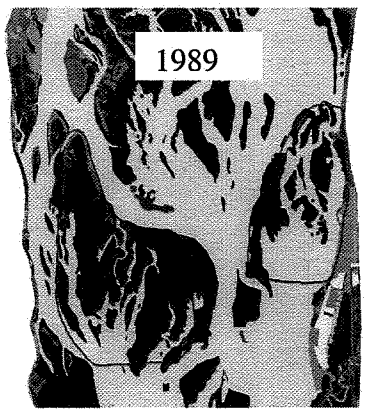
Pool 8 Islands HREP Phase 1 and 2
Land Cover Change
1975-1989-1994-1998-2000

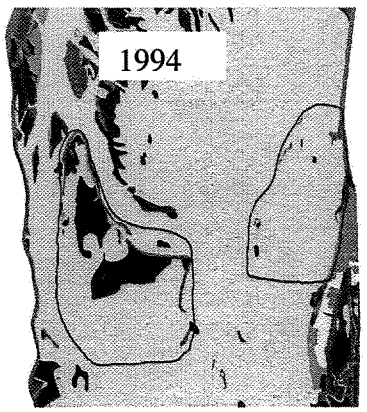
Land Cover/Use Types	Acres				
	1975	1989	1994	1998	2000
Open Water	52.15	52.64	115.53	77.34	65.55
Submersed Aquatic Bed	18.35	18.90	0.94	38.64	51.59
Floating-Leaved Aquatic Bed	29.65	58.40	17.74	16.06	15.04
Semi-permanently Flooded Emergent Perennial	36.09	7.21	1.51	1.48	1.70
Seasonally Flooded Emergent Perennial	1.13	0.04	0.15	0.00	0.00
Wet Meadow	2.33	2.60	4.25	0.57	5.62
Grassland	0.26	0.00	0.00	0.00	0.38
Scrub/Shrub	0.67	1.45	1.41	4.83	0.18
Salix Community	0.95	0.44	1.03	0.00	1.64
Populus Community	0.04	0.00	0.00	0.00	0.00
Wet Floodplain Forest	2.31	0.96	1.34	1.86	1.27
Mesic Bottomland Hardwood Forest	0.00	0.16	0.00	0.00	0.00
Sand/Mud	0.00	1.16	0.00	3.11	0.00
Developed	0.84	0.84	0.88	0.90	1.80
No Photo Coverage	0.01	0.00	0.00	0.00	0.00

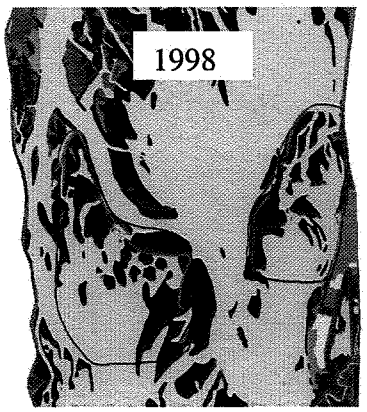












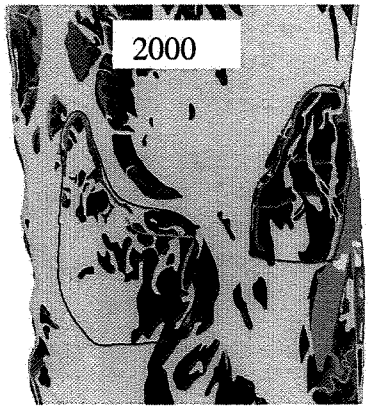
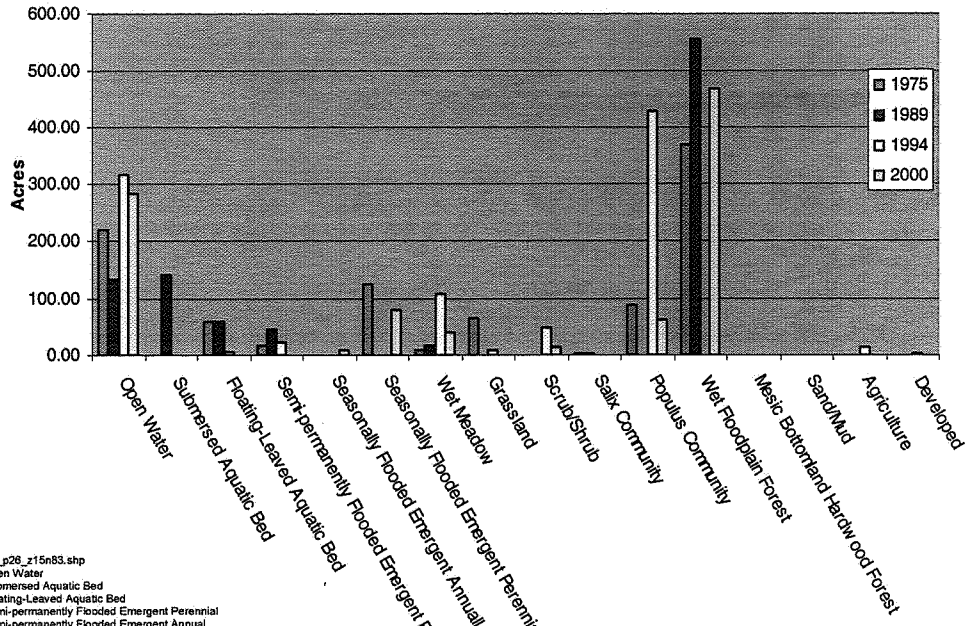
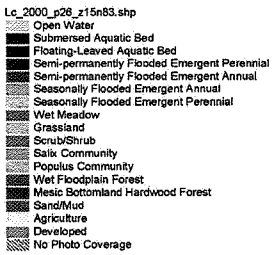


Figure 5. Dresser Island HREP Land Cover Change, 1975-1989-1994-2000.

Dresser Island HREP
Land Cover Change
1975-1989-1994-2000

Land Cover/Use Types	Acres			
	1975	1989	1994	2000
Open Water	220.56	132.39	315.71	282.65
Submersed Aquatic Bed	0.00	141.48	0.00	0.00
Floating-Leaved Aquatic Bed	58.96	59.00	5.51	0.00
Semi-permanently Flooded Emergent Perennial	15.72	46.08	23.22	0.34
Seasonally Flooded Emergent Annual	0.00	0.00	0.00	7.53
Seasonally Flooded Emergent Perennial	124.76	0.00	0.00	78.99
Wet Meadow	9.85	17.58	107.71	40.14
Grassland	65.60	0.00	8.39	0.00
Scrub/Shrub	0.00	0.87	47.92	14.23
Salix Community	2.61	1.63	0.00	0.00
Populus Community	86.98	0.00	428.21	61.18
Wet Floodplain Forest	367.67	554.66	0.00	468.54
Mesic Bottomland Hardwood Forest	0.00	0.00	0.00	0.00
Sand/Mud	0.87	0.00	0.46	0.00
Agriculture	0.11	0.00	14.84	0.00
Developed	0.00	0.00	1.72	0.10





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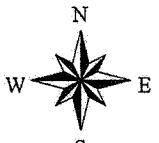

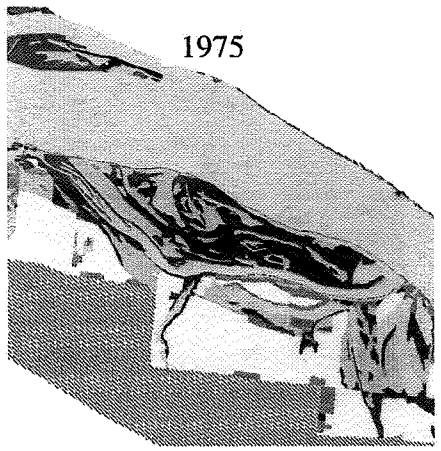

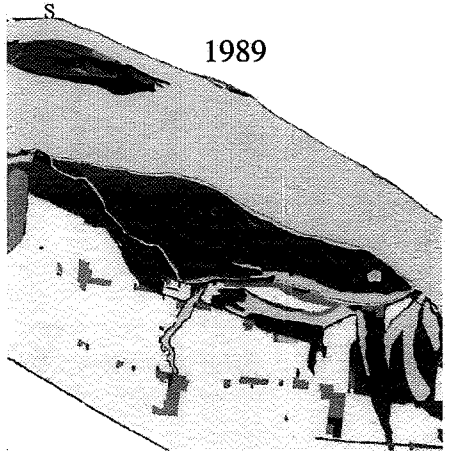

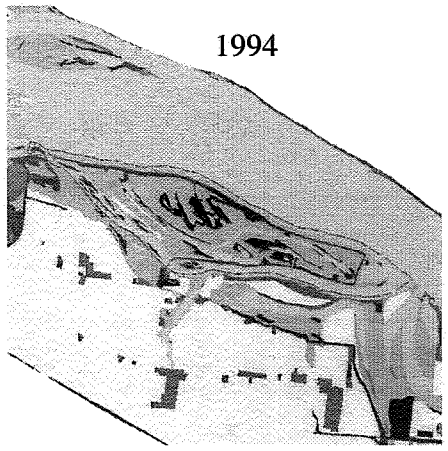

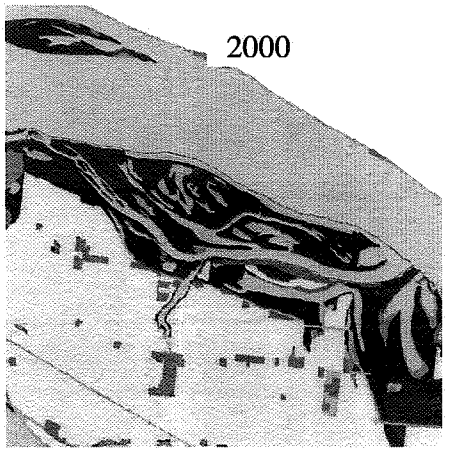

Table 8. Total Floodplain and Percentage Floodplain Within HREP Sites (per Pool).

District	Pool	HREP Acres/Pool (all phases)	Total Floodplain Acres	% Floodplain within HREP
St. Paul	UMR1	--	3736	#VALUE!
8.1% of total floodplain	UMR2	1170	23152	5.1%
	UMR3	3000	23660	12.7%
	UMR4	760	62157	1.2%
	UMR5	3043	28165	10.8%
	UMR5a	1211	17733	6.8%
	UMR6	1785	21817	8.2%
	UMR7	1731	23519	7.4%
	UMR8	1865	38074	4.9%
	UMR9	9185	51027	18.0%
	UMR10	3300	38958	8.5%
Rock Island	UMR11	12546	29273	42.9%
5.5% of total floodplain	UMR12	8156	20431	39.9%
	UMR13	10368	59217	17.5%
	UMR14	1144	25936	4.4%
	UMR15	--	9223	0.0%
	UMR16	393	26821	1.5%
	UMR17	1198	72362	1.7%
	UMR18	6425	134457	4.8%
	UMR19	--	118929	0.0%
	UMR20	--	75283	0.0%
	UMR21	8211	66617	12.3%
	UMR22	745	84305	0.9%
	IWWLockport	--	15429	0.0%
	IWWBrandon	--	1859	0.0%
	IWWDresden	--	6086	0.0%
	IWWMarseilles	--	25525	0.0%
	IWWStarved Rock	--	13935	0.0%
	IWWPeoria	3120	131317	2.4%
	IWWLaGrange	10174	221227	4.6%
St. Louis	UMR24	1498	95111	1.6%
2.1% of total floodplain	UMR25	7834	87530	8.9%
	UMR26	6020	119762	5.0%
	UMR26-Mile 118	300	278588	0.0%
	Mile 118 to 0	600	395123	0.2%
	IWWAlton	7880	197034	4.0%
	All Pools	***113661***	***2643378***	***4.3%***